

Crypto Currency and Decentralized Provision of Global Public Goods

Hiroshige Tanaka

Faculty of Economics, Chuo University,

Higashinakano 742-1, Hachioji-city, Tokyo 192-0393, Japan.

Abstract

Appropriate provision of global public goods might be indispensable elements for global communities to be stable and sustainable. A series of global problems exhibit many confronting bottlenecks for the global public goods. Firstly, governmental provision of global public goods needs the international cooperation. As the cooperation should require shearing costs of funding international institutions and agreement on integrated legislation and others. Secondly, global funds for finance and private provision of currencies have become to be one of controversial issues of global public goods. This paper demonstrates the hypothesis that the crypto currency should displace the global public goods. We construct the theoretical framework of global finance reconstructed by the development of blockchain technology. The theoretical investigation could foresee the possibility that emergence of crypto currencies improves global financial services. The reform of the money system could create more trust and provide money appropriately for increasing demands by reducing transaction costs.

Key Words: Crypto Currency, Global Financial Services, The Fourth Industrial Revolution, Two Currency Markets, Best Mix of Trust Creation.

1. Introduction

The fourth industrial revolution projects the clear image that the two distinct issues, globalized and shrinking economies,¹ are common problems in the many societies. The innovation in intelligent industries triggers to accelerate diversification of industries. In general, the revolution of markets and societies has been enhancing the efficiency of communication such as person to person and person to company. Enlarging diversification of lives and incomes in the residents have been proceed remarkably. The progress of AI and ICT technologies is promoting the decentralization of productions and consumptions in economies. Governments and large industrial institutions could not achieve the efficient performance regarding diverse social and global needs. That is, the increase of the money supply by the governments is not necessary to satisfy swelling social needs.

The innovation of financial technologies had enhanced the money supply from the 1980s and the 1990s and made the global financial mechanism more unstable. Many governments owed the debts to alleviate the recession from the global financial crisis 2008-09. To avoid the defaults many governments have adopted the policies to curtail the spending on social security that has presented high social needs. The principle of austerity in the government budgets tends to decrease the subsidies to improve regional developments. The government failures in the global finance crises possibly cause unstable global problems and regional distortions².

The fourth industrial revolution could provide a new option in the global public goods. It is supposed that the emerging currency is a product of innovation in the intelligent technologies and that the private transactions invent and develop the crypto currency. The technology of blockchain could develop the decentralized system of trust. The crypto currency is supposed to evolve outside the currency system of government and bank. This paper argues that the emerging currency could take the place of a global public goods to transform the established social and economic systems.

¹ Leigh and Blakely(2013) survey the back ground of the regional features. Tanaka H. and C. (2016) make the theoretical foundation and prove the empirical evident in the Tokyo Area.

² Tanaka (2016) presents the theoretical framework to provide global pubic goods by governments and markets cooperatively.

The currency must be confirmed widely by acceptable trust in the transaction. Globalization and the fourth industrial revolution evolve the transaction of economies and seek efficient settlements for needs. Many types of currencies have developed competitively and cooperatively. By an innovative system of trust creation the invented settlement system turns out to perform functions of currency.

The globalized markets make opportunities to enlarge the transaction by reconstructing trust scheme connected with reform of currency. This paper demonstrates theoretically that the crypto currency could improve sustainability of global communities as a global public good in the four points. Firstly, the high transaction cost and the restricted scope in the financial services lower the sustainability and cause the disparity in global communities. The cost benefit analysis explores the dead weight loss of cumbersome monetary system and the social surplus of trust created by crypto currency. Secondly, since the blockchain revolution can provide efficient trust in more large scale, the growth of global financial services will trigger development and decreasing disparity in many regions. Thirdly, the social surplus represents the total values of the incentives to reform global and local financial system. The development of blockchain technology influences the social surplus. Fourthly, the global communities are expected to enhance relative role of the crypto currency in the finance system. As the crypto currency improves the efficiency, the government and bank currencies lower the needs for finance but the social welfare of global communities could increase by revolution of the financial system.

This paper is organized as follows³. The section 2 discusses that the innovation of financial technology has not performed to enhance long term investment. In the meantime, the unstable economies and disparities in societies have appeared evidently. It is argued that the scheme for environment, society and governance has approached on sustainable investment. The section 3 presents the theoretical model to explore the global financial framework including decentralized currencies. The section 4 offers the analytical method of the impact on the global communities by innovation of blockchain technologies. The section 5 investigates the social cost of currencies in economies after

³ Tanaka (2018) to be written by Japanese presents the implications of this paper with adding some Japanese references.

the global financial crisis 2008-09 and the market structure in which the blockchain technology is feasible to develop the crypto currency sustainably.

2. Innovation of Financial Technology and Sustainable Community

The deregulation and the liberalism in market economies from the 1980s and the 1990s have increased money stock. Large amounts of money created in financial market have been invented to achieve a short-term profit. The money stock concentrates on some limited field by avoiding the risk of bankruptcy. This distortion in money flows is supposed to decline the incentives for long term investment and to lower the qualities of social life in inactivated regions. In some regions with declining economies, the financial costs to settle the transaction are hold too high to activate economies⁴. The fourth industrial revolution is expected to improve the efficiency of the finance services in many social needs. In this paper, the decentralized technology to provide currency can be proved that the cost of financial services decreases and that the global finance activating the crypto currency increases to vitalize more large regions. The framework to connect the fourth industrial revolution and the decentralized currency is sketched in Figure 1.

This paper focuses on the financial system to achieve sustainability in global communities. The efficient trust system to be needed in global economic transactions is defined as a global public goods or global commons. Stiglitz (2006) expresses that global public goods are an efficient method for financial systems in global society. “Global public goods and their externalities constitute powerful tools for the analysis of global governance, its institutions and their flaws, the fundamental problems of market failure in the provision of global public goods, and potential solutions.”⁵ Tanaka(2016b) presents a theoretical analysis that market and government failures in the global public goods make impacts on stability and sustainability of global communities.

⁴ Kay (2015), in Chap 8, argues that the innovation of financial technology raised by the deregulation has increased costs in financial services.

⁵ Stiglitz(2006),pp.149.

The innovation of finance technology has securitized residential housing loans and debts since the 1990s. Many trades of financial commodities in the markets aim to gain the profit from the price gaps between sell and buy. The trades have increased remarkably by creation of new financial commodities. The trade to get short term profits makes the financial systems more instable. The regulation and the legislation to prevent the financial system from corrupting have effects to slow down the long term investment. PRI (Principles of Responsible Investment) discusses the sustainable scheme for the global finances⁶. In the sustainable scheme firms and institutions pursue not only economic performance, but execute social responsible investment to produce values in a long term environmentally and socially. If the social responsible investment could raise the long term investment partially, many stakeholders in the outside of the institution and organizations should share the value of social projects. The initiative to promote cooperation within the communities is needed to develop in more large scales⁷.

The development of trades in stock and bond markets did not necessary contribute the construction of sustainable financial system. Many governments spend tax revenues from people to save the financial institutions in the period of the global financial crisis 2008-09 and are willing to supply more money to recover the deflation after the global crisis. Increment of money stock enhances the risk to fall the value of money and becomes more probable to bring the loss of social welfare such as default and devaluation of currency.

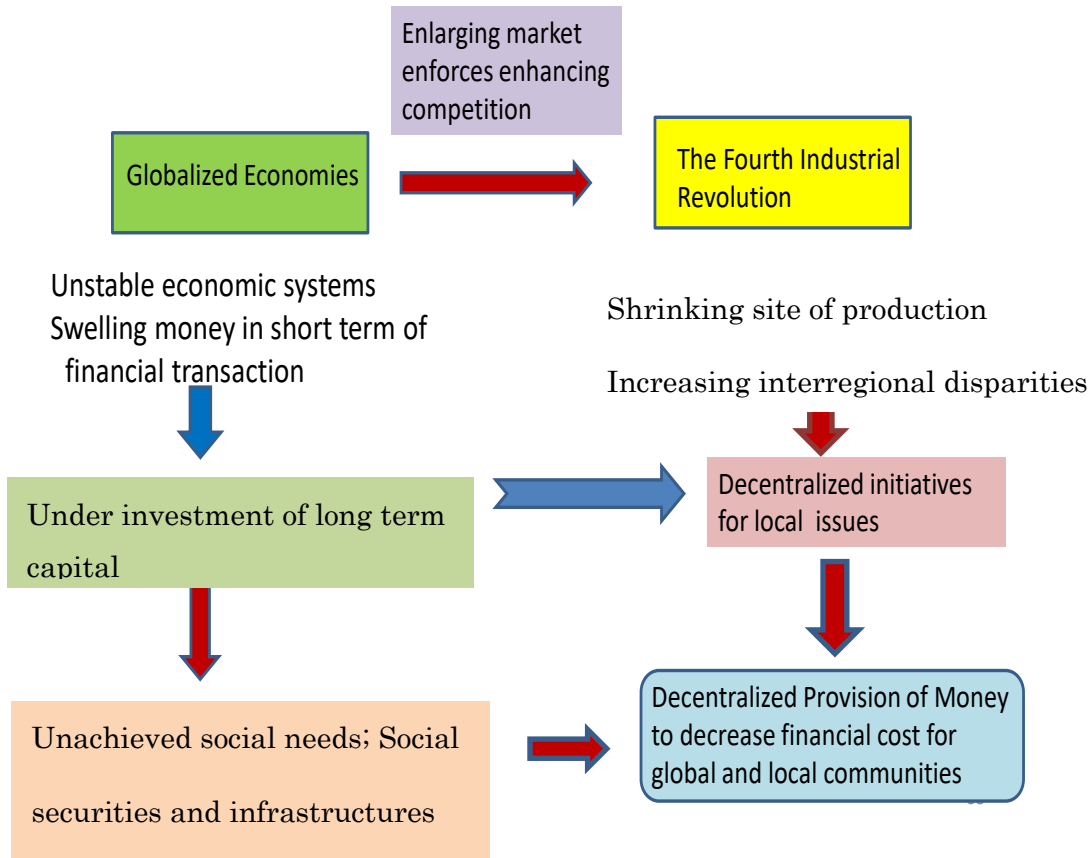
In the regions to remain low level in economic performance globally or locally, financial institutions are not available for residents conveniently. Insufficient provision of financial services makes obstacles to improve social lives and economic activities. These communities can be featured by limited sources of funds.

Generally, residents need to depend on mutual supporting scheme of regional or

⁶ UNEP FI and UN Global Compact (2006).

⁷ Tanaka(2016b) demonstrates theoretically that ESG(Environment, Society and Governance)Mechanism contributes sustainability of the global society. Becchetti and Borzaga (2010) explore theoretically that the social enterprise contributes the social responsibility.

cognate networks for large amount of spending of business and housing. And they have few means to insure their properties from the risks of depreciation of money value by



Source: Produced by author

Figure 1 Decentralized Provision of Currency

inflation, robbery and natural disaster. However, an innovation of ICT has developed blockchain and a decentralized currency will be available more easily for settlement of transaction in wide range of regions. This innovation in currency system is expected to improve social capital and infrastructure and could contribute sustainability of communities. The above discussion on the decentralized provision of currency is summarized in Figure 1.

3. Theoretical foundation on the two currencies model

The fourth industrial revolution promoted by innovation of technologies in the ICT, IT and AI seems to reduce the advantageous benefits in the large scale of manufacturing industries. The waves of structural change initiated in manufacturing industries are expected to overflow into intellectual and service industries. The financial services to be located in the fundamental industries are focused as one of the main field of the fourth industrial revolution. This section explores the impact on the financial industry by the innovation of intelligence technologies. In particular, the development of crypto currency might not only influence the mechanism of money supply but also improve social investment efficiently in the global communities. The supply of money for the global communities to achieve sustainability of communities could be classified theoretically as global public goods. Tanaka (2016b) proposes a cooperative scheme to provide global public goods for the sustainable and stable global communities. This paper exhibits that the shearing rule between the crypto currency and the official currency will be decided by competition for efficient trusts. It is indicated theoretically that this new currency system improves social welfare globally. Tanaka (2013) provides the method to evaluate the innovative effect in the global public goods. In this paper, this evaluation method is applied on the innovation in the emerging currency. The impact analysis on the innovation makes clear that the increasing transaction using the block chain technology reforms the systems of currency and creates trust to achieve many social needs. The crypto currency is demonstrated to compose a critical part of financial system in global economies.

By employing the two market models we could investigate the features of the crypto currency. x denotes the total trust created by global money market. It is assumed that the total trust supply x is divided into x_1 to be created by the official money supply and x_2 to be yielded by the decentralized currency supply including crypto currency. The official and the decentralized currencies are named by the first and the second currencies in the following parts of this paper. The relation stated above is exhibited formally by the expression,

$$x = x_1 + x_2. \quad (1)$$

$B(x)$ is defined as social benefit of trust creation x in global society. And $\frac{dB}{dx}(x)$ writes marginal social benefit of money supply in global society and estimates the

marginal value of trust. The marginal values are assumed to be decreasing. We could obtain various gains from the transactions and the preservation of asset values by using money. The value of money is possibly to fluctuate abruptly by the economic and social changes. If the currency of one country is possibly to make a loss of asset values, the incentives to obtain the currency decrease. The currency used as the means of the transaction and the restoring value is replaced by other currency with more trusty governments. The prolonging deficiencies in government budgets are estimated to decrease the solvency for the debts and currency of the country is not likely to be employed as settlements in the international trades. Usually, global communities use many currencies in the trades. The trust system in the global transaction is distributed in many states. The crypto currencies are classified in the decentralized currencies by distinguishing from the official currencies of central governments. Many users require the values of the currencies not to fall greatly. Since the national currencies are benchmarks on the economies and societies of the states, many residents might wish the values of currencies to be stable. The governments and the central banks serve cooperatively the duty to save the value of the moneys. Bank money is due to provide credits to achieve the related market transactions. To prove the credits publicly, banks must observe the required regulations and legislations. The evolution of technologies in ICT and intelligent industries develops new technologies to provide efficiently credits. The trust system of the crypto currencies is certified by the block chain technologies in the innovation of the ICT. In decentralized money system each type of currency owes the social responsibility on the trust systems. The evaluation of trust could be estimated appropriately by marginal social welfare of money supply. This shift of technologies is expected to transform structures in the money market and to create wide market transactions in the both fields of business and life.

Since the two types of currencies are assumed to obtain different characters in the cost functions, the emerging currency classified by the second currency is expected to create trusts for some social needs. Since the 1980s, deregulation policies in the finance industry could contribute to develop money supply by the innovation of financial technology. The enlarged scale of money has raised global economy. At the same time, the financial market has accelerated increase of money supply by the short term trade to purpose the gain from sale. The innovation of financial technologies turns up to causes the global financial crises 2008-09. After the great crises the government debts have enhanced to

prevent the bankruptcy of private economies. The first currency cannot afford to create sufficient trust by the burden of swelling government debts. By comparing the first currency, the crypto currency as the second currency might be relatively small the capacity to provide trust by the restriction of developing technologies. If the crypto currency becomes to be used at the settlement of ordinal transaction, the reserve funds to pay cash for governments and banks to be required will be decreasing. The social costs of the first currency such as survey, audits, and proofing improper behaviors will reduce by decrease of transaction. Since the technology of block chain internalizes a part of the auditing procedures, the social cost of the second currency is supposed to be relatively lower than the cost of the first currency.

To formulate the mathematical expressions the social cost to create x units of trust is defined by function $C(x)$. The social cost contains the operational cost in market by the governments and financial institutions, the expected cost from the fall of trust and the cost of efforts to prevent the financial bankruptcy. It is assumed that the social marginal cost is increasing with trust. The social cost functions of trust for the two types of currencies are expressed by $C_1(x_1)$ and $C_2(x_2)$. The cost functions are constituted by the internal costs $F_1(x_1)$ and $F_2(x_2)$, costs of audits and penalties per trust t_1x_1, t_2x_2 and external costs from falls of trust $L_1(x_1)$ and $L_2(x_2)$. t_1 and t_2 are positive constants. The social cost functions with the two types of currencies are denoted by

$$C_1(x_1) = F_1(x_1) + t_1x_1 + L_1(x_1),$$

$$C_2(x_2) = F_2(x_2) + t_2x_2 + L_2(x_2).$$

The effects of mining in the crypto currency and new digital technology on the settlements are assumed to be presented by the inequalities $F_1(x_1) > F_2(x_2), t_1 < t_2$. Comparing with the first currency we suppose that the external costs of the second currency are lowered by the decreasing uncertainties in the transaction by the block chain technology but raised by the fragility for speculation for gain from sales, vulnerability risks in cyber space and others. The above assumption is stated formally by $L_1(x_1) > L_2(x_2)$. The marginal cost functions for the two types of currencies are assumed to be increasing with trust as ordinal theoretical cost functions and defined as follows.

$$\frac{dC}{dx} > 0, \frac{d^2C}{dx^2} > 0; \frac{dC_1}{dx_1} > 0, \frac{d^2C_1}{dx_1^2} > 0; \frac{dC_2}{dx_2} > 0, \frac{d^2C_2}{dx_2^2} > 0.$$

We suppose that a system of two types of competitive currencies evolves to improve gradually the global economy and society. Various banking services and facilities such as ATM prompt to enlarge the first currency. The enlarged banking services increase

the average cost of providing currency and are reflected to raise the transaction price of financial services. Enlarged amount of the first currency brings many kinds of cost such as payments of interests, requirement for payment, management payments to prevent improper financial behavior and others. The payments result in burden of people by raising taxes or lowering subsidies. When the governments fall into the bankruptcy, large amounts of social losses raise burden of people from inflation, and unemployment and other problems. Avoiding the social risks takes the social costs to enforce regulation and audit system. Consequently, the trend of globalized economies and innovation in the intelligent technology has developed markets and moved the marginal benefit curve and marginal social cost curve of the first currency upwardly. Meanwhile, the second currency could curtail a part of social cost in the first currency but should count the preventing cost for the fucking in cyber space and social cost from gains from sales.

To explore the structural changes brought by the second currency we should focus on the feature of the cost function in diversifying currency markets. The needs for the trust are diversified actually and achieved properly in some specific markets. Currency does not only bring the transaction cost but may take risks to fluctuate value. Currency contains market costs and external costs. The institutions of trust creation x need to pay costs to minimize the market costs and the external costs. Each decentralized currency system could control to lower the external costs by the blockchain technology. The market costs are expected to remain low in a small trust but to increase rapidly as the transaction rises. The best mix of trust creation of the first and the second currencies will form to create trust efficiently and properly in the future. In the present trust system the variation of currency value possibly incurs great amount of losses for a large part of society. The greater the trust creation increases, the higher transaction costs and social risks enhance. The expected social cost to provide trust creation x is expressed by $C(x)$ and referred simply as the social cost of trust in this paper. The social cost is supposed to occur in the both currency markets. This relation is expressed mathematically by

$$C(x) = C_1(x_1) + C_2(x_2) . \quad (2)$$

$$NB(x) = B(x) - C(x) , \quad (3)$$

defines net social net benefit of trust creation in the global society. The above functions are assumed to be continuously differentiable. Optimal conditions to maximize net benefit of trust, x_1, x_2 are stated as the solutions of (4).

$$\frac{\partial NB}{\partial x_i} = 0, i = 1, 2. \quad (4)$$

(4) are rewritten by (5).

$$\frac{\partial W}{\partial x}(x) \frac{dx}{dx_i} = \frac{dC_i}{dx_i}(x_i), i = 1, 2. \quad (5)$$

When we substitute the equations, $\frac{dx}{dx_i} = 1, i = 1, 2$, into (5), (5) is replaced by

$$\frac{dW}{dx} = \frac{dC_1}{dx_1} = \frac{dC_2}{dx_2}. \quad (6)$$

The value of the trust has been fluctuated repeatedly in the recent history⁸. When domestic economies in many states present a good performance, the official currency to be provided by governments and banks can settle almost domestic transactions efficiently. In the period of the worse economic situations international currencies circulate to substitute the trustless domestic currency. The trust is supposed to be utilized selectively in transactions according to relative values evaluated by marginal costs. Various types of currency are designed for the diversified social needs to be achieved. When the crypto currency becomes to be transacted more largely, it should be allocated to obtain the optimal condition of currency (6). When the decentralized currencies increase, the currencies can be reconstructed to achieve optimal system of trust. (6) is supposed to exhibit a sort of best mix condition of currencies.

4. Innovation of technology in the emerging currency

⁸ Many researches are available for this subject. As an example, Roubini and Mihm (2010) retrospect on the fluctuation of assets value in the history of financial crises.

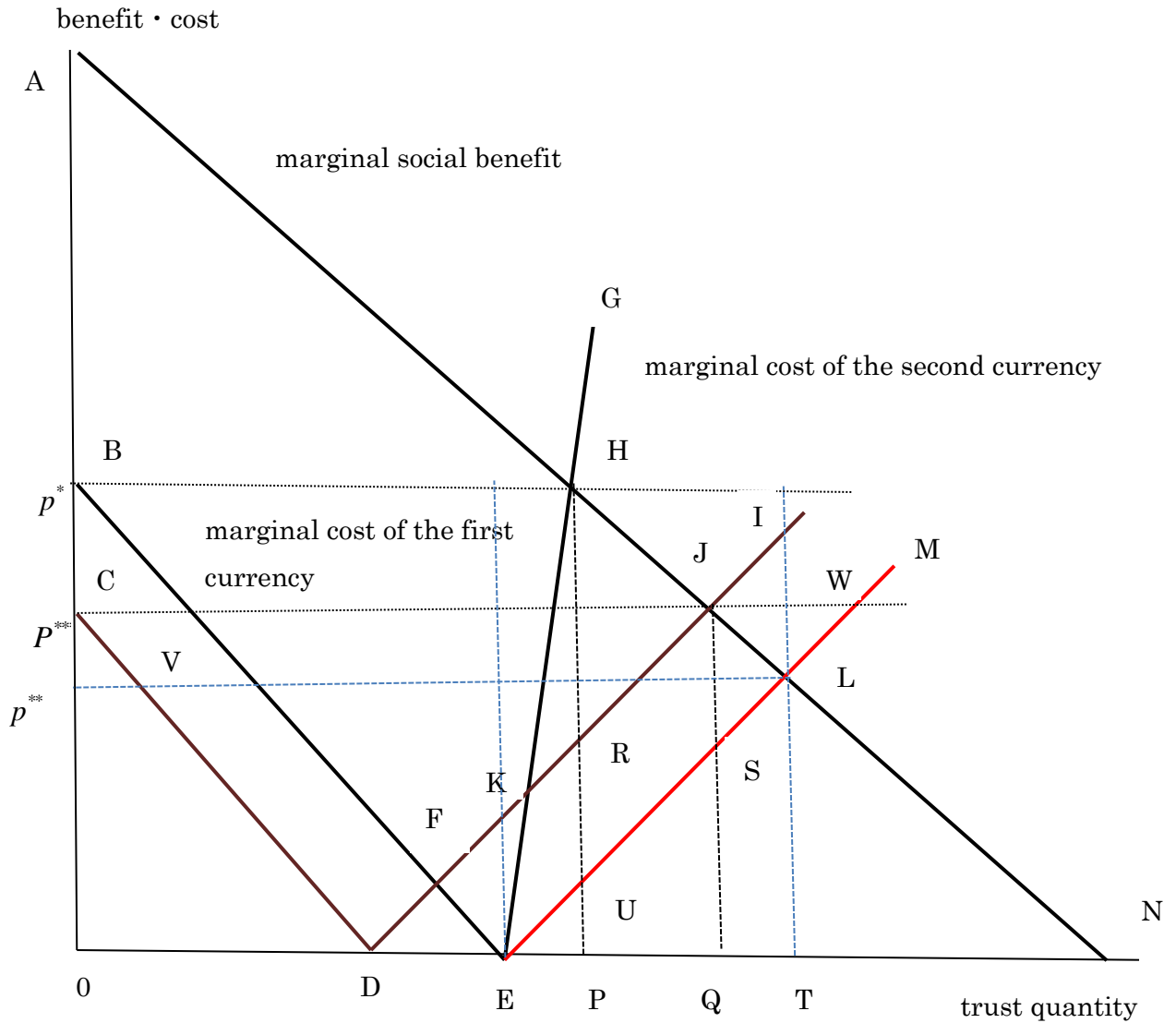
We explore why crypto currencies are expected to be more prevailing in our economies and societies. In the first, we attempt to construct a theoretical framework to demonstrate that innovation in the intelligent industries makes effect on the enlarging distribution of crypto currency. In the second, many global public goods including global finance are indicated not to provide enough amounts. Tanaka (2016a) defines the stability and the sustainability of the global community by using the index of global public goods and proposes the sharing rule of the cost and benefit among community members in the public and the private sectors. As the crypto currency is expected to be available openly for cross border transactions, it will proceed to place the position of the global public goods. Presently, many crypto currencies are not necessarily to be qualified as global public goods, because they could be transacted relatively in the restricted usages. If settlements by using crypto currency are growing steadily, some crypto currencies might be recognized as global public goods.

In beginning to explore theoretically the progress of the crypto currency, we should assume that the decentralized provision of currency accelerates improvement of technological and institutional frameworks to create trust by the three following stages. However, the innovation in the crypto currency is not assumed to make effects directly on the efficiency of the first currency. By using Figure 2 we explain that the innovation enhances the function of the digital currency. Curve AN expresses marginal benefit of trust by the currencies as global public goods and is assumed to be decreasing. The marginal costs of trust by the first and the second currencies are exhibited by curves EB and EG. The distances from the origin point E on the horizontal axis present the created trusts by the two currencies.

In the first stage the settlement of transactions for the second currency is assumed to be restricted by the blockchain technology. When the settlement of transactions is proceeding in a growth process, the potential capacity to create trust is bounded from above. The marginal cost function of the second currency is supposed to obtain steeper slope than of the first one. The optimal condition (6) is indicated by the point H. In this point the currencies of the first type and of the second type create trust of OE and EP. The total distribution of trust to be presented by OP is a part of the total potential needs of trust HP. The actual transaction or investment to be indicated by PN tends to concentrate on some disadvantageous regions for the economic activities. When the rate PN to ON increases, disparity in regional activities possibly enlarges.

In the second stage, the innovation of technology and the arrangement of social scheme

are assumed to make the slope of marginal cost curve of the second type of currency gentler. EG curve rotates toward the west and downward⁹. The technology of blockchain solves the uncertainty about the transactions. However, the exchange between the two types of currencies is affected by the speculation of currency markets. In the process of innovation, temporarily the second currency is supposed to bring a diverse market price of trust p^{**} from the equilibrium price p^* of the first stage. The innovation of blockchain



Source: produced by author.

Figure 2 The impact of innovation in the second currency

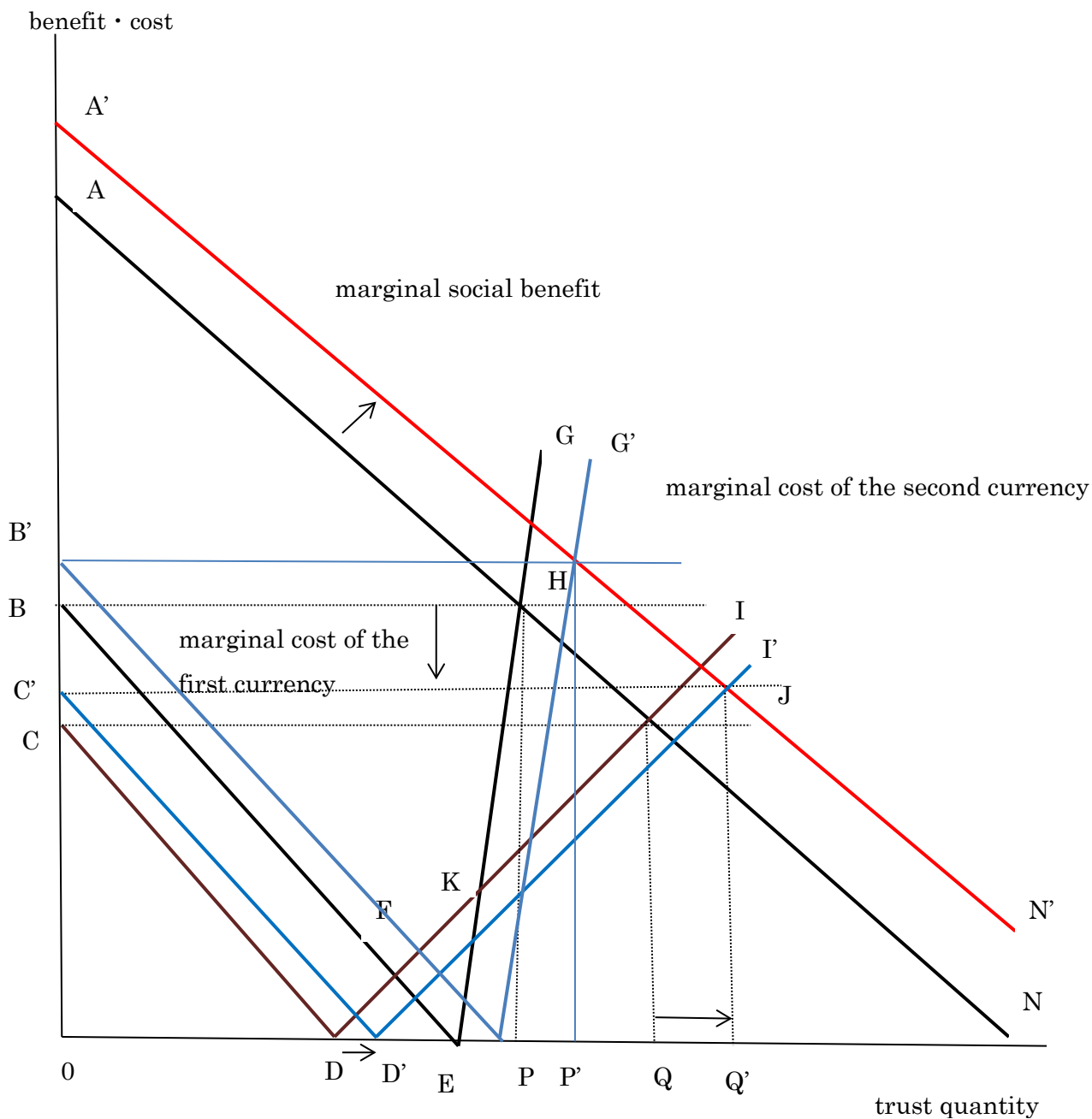
⁹ Tanaka(2010) discusses that the method analyzing marginal cost explains the effects of innovation.

technology lowers the market price of trust and yields the social surplus represented by the area of triangle HEL. The innovation of technology of currency creates trust PT additively by the incentive scheme to obtain the social surplus.

In the third stage, the increment in the trust market of the second currency influences the trust market of the first currency. The enlarged trust in the second currency will replace a part of the transaction by the first currency. For example, the inefficient payments by the bank is replaced by the transaction by the second currency. The change in financial market can be achieved without decreasing social surplus and illustrated in Figure 2. The displacement by the second currency moves the marginal cost curve BE in Figure 2 to CD downward. The turning point E between the two type of currencies shifts leftward to the point D. The reconstruction of trust markets curtails the total trust OT into OQ. However, the trust OQ is greater than the initial amount OP before the second currency is used in actual transaction. And this reconstruction raises the social surplus from the area of the quadrangle ABEL to the area of ACDJ. The decline of trust by the first type currency curtails the cost to create trust by the area of the quadrangle BCDF but the replacement of currencies for the transaction reduce social surplus by the area of the quadrangle FELJ. Reminding that the two parallelograms CDEV and DEWJ have area with the same bottom and height, the reconstruction of trust markets produce increment of social surplus by the total area of the triangle JLW and CVB. The variation of market price, $p^* - p^{**}$ makes effect on the total area. The incentives to promote reconstruction of trust creation depend on the initiatives to reduce the price of transaction including reform of financial market.

In the next, we suppose that the global society increases the demand for the trusty currency. Figure 3 presents that marginal trust curve AN move upward to the curve A'N'. In the first stage when the second currency is not spread to be used widely, the new market equilibrium is presented by the point H. Comparing the point H with the equilibrium in Figure 2, the price and the quantity increase by BB' and PP'. In the third stage, the second currency develops actually, the market equilibrium is exhibited by the point J. To compare the point H with the equilibrium in Figure 2, the market price rises by CC' and the both currencies increases quantities by DD' and QQ' to correspond with increasing demand for trusty currency. Figure 3 shows the relations $BB' > CC'$ and $PP' < QQ'$. The results imply that the responses with two stages should be performed as follows. The raising price aims to decline the increase of demand temporally in the first stage. And the both currencies should contribute to increase

creation of trust. If the innovation of trust market works well, the second currency is expected to enhance the weight of contribution.



Source: produced by author

Figure 3 The two currencies markets and increasing demand for trust

To make clear the graphical analysis to employ Figure 2 and 3, we develop numerical methods of demonstration by the linear approximation of marginal curves. The optimal condition (6) to maximize social net welfare is rewritten by the linear expression

$$-b_1(x_1 + x_2) + b_2 = c_1x_1 = c_2x_2. \quad (7)$$

By the way, b_1, b_2, c_1, c_2 are positive constants. The following equations from (8) through (11) are derived from (7). We obtain the following implication from these equations.

$$1. \quad x_2 = \frac{c_1}{c_2} x_1. \quad (8)$$

(8) implies that the trust creation by the second currency is determined proportionally to the scale of the first currency. When the creation of trust by the first currency is large, the counterpart of the second currency is also great. The innovation of crypto currency decreases c_2 . (8) is rewritten by

$$\frac{x_2}{x_1} = \frac{c_1}{c_2}.$$

The above expression states that the progress of technology with crypto currency means enhance of the rate $\frac{x_2}{x_1}$ to indicate the shear of emerging currency with total trust

creation. On the contrary, lowering $\frac{c_1}{c_2}$ declines $\frac{x_2}{x_1}$. When the first currency increases

the efficiency to create trust, the government and banks raise relatively more trust creation than the second currency.

2. If the technological conditions of the first currency indicated by c_1 are supposed to be constant, (9) and (10) indicate the decrease of x_1 and the increase of x_2 . The innovation of technology in the crypto currency raises the weight of the second currency in trust creation.

$$x_1 = \frac{b_2}{b_1 + \frac{c_1}{c_2} b_1 + c_1}. \quad (9)$$

$$x_2 = \frac{b_2}{b_1 + \frac{c_2}{c_1} b_1 + c_2}. \quad (10)$$

Reminding that b_2 is an index on the scale of trust market, (9) and (10) indicate that increase of trust demand requires the both types of currency to enlarge trust creation.

The more efficient the currency creates trust, the greater it takes share in the total trust.

3. (11) implies the relations of substitution and complement in the decentralized system.

$$x = \frac{b_2}{b_1 + \frac{c_1 c_2}{c_1 + c_2}}. \quad (11)$$

When both c_1 and c_2 are smaller than 1, the both types of currencies improve efficiency in the trust creation and lower c_1 and c_2 . The value $\frac{c_1 c_2}{c_1 + c_2}$ decreases and supply of trust increases. In some situations, the improvement in one currency might bring only the substitution between the two currencies but could not increase total amount of trust. In the words, to achieve flexible system providing trust the innovation of technology with crypto currency should not only substitute but also induce to improve the trust scheme by the government and the banks.

5. Concluding Remarks

Tanaka(2016a) argues that the market and government failures in the global societies since the global financial crisis has turned out to raise social cost in the financial services. The social cost of currencies contains many components. In the period of inflation the value of currency as an asset reduces. When banks fall into bankruptcy, the deposits saved by the institutes disappear. The institutions must certify the trust of finance transactions to observe regulations. The cost to execute social responsibilities of financial institutions are classified as the social cost. It is afraid that government payments to avoid financial crises and swelled national debts to stimulate stagnant economies are cause defaults by the governments. These factors described above incline to lower the values of currency in the global society.¹⁰ The social cost to create trust tends to be rising globally and to enhance the fragility of global community.

This paper argues the reform to improve market and government failures in the situations to emerge the crypto currency. This paper employs the two currencies model. The theoretical analysis is based on the two markets model. In Figure 2 to achieve the optimal points H and J the marginal cost in the two markets must be comparable with each other. The scheme to exchange the two currencies efficiently can improve social net benefit.

The first currency includes many currencies published by governments and banks. The value of the first currency depends on the evaluation by the foreign exchange markets. However, the crypto currency is supposed to settled global transactions by the market separated from the foreign exchange markets. The crypto currency possibly influences to change the many economies and societies and could improve social net welfare globally. The development of the crypto currency depends on the innovation of the block chain

¹⁰ Martin(2013) discusses the issues of default in the history of money.

technology. We must prevent the monopolistic or unfair competition on this basic technology to save the distortion of social net benefit.

References

- Becchetti, L. and C. Borzaga(2010) *The Economics of Social Responsibility: The world of social enterprises*, London, Routledge.
- Kay,J.(2015),*Other People’s Money: Masters of the Universe or Servants of the People?*, London, Profile Books Limited.
- Leigh,N.G. and E.J.Blakely(2013) *Planning Local Economic Development: Theory and Practice* (Fifth Edition), Los Angeles, Sage Publications,2013.
- Martin,F.(2013) *Money: Unauthorised Biography*, New York, Knopf, Doubleday Publishing Group.
- Richardson,H.W. and C.W.Nam(eds)(2014) *Shrinking Cities: A Global Perspective*, London and New York, Routledge.
- Rifkin,J.(2014) *The Zero Marginal Cost Society: The Internet of Things, The Collaborative Commons, and The Eclipse of Capitalism*, New York, St.Martin’s Press.
- Roubini N. and S.Mihm (2010), *Crisis Economies, A Crash Course of the Future of Finance*, New York, Penguin Press.
- Stiglitz,J.E.(2006) “Global Public Goods and Global Finance: Does Global Governance Ensure That the Global Public Interest is Served?,” in Touffut, J-P,(ed.)(2006) *Advancing Public Goods*, The Cournot Centre for Economic Studies 2006, Edward Elgar Publishing Limited, Cheltenham, UK, pp.149-164.
- Tanaka,H.(2010) “Global Public Supports for Innovation in Environmental Technology,” *Finance and London Accord Web Papers*, pp.1-12. (Accessed October 30, 2017) http://www.longfinance.net/images/reports/pdf/tanaka_innovation_2010.pdf
- Tanaka,H.(2013) “The Finance System as Global Public Goods and The Regeneration Of Global Communities,” *Long finance and London Accord(Web Papers)* ,pp.1-12. <http://www.longfinance.net/component/longfinance/?view=report&id=533> (Accessed October 30, 2017)
- Tanaka,H.(2016a) “The Finance System as Global Public Goods And The Regeneration of Global Communities,” *Long finance and London Accord Web Papers*, 2016,pp.1-12, <http://www.longfinance.net/component/longfinance/?view=report&id=463>

(Accessed 30 October, 2017)

Tanaka,H. and C.Tanaka(2016) “Urban Reform and Shrinking City Hypotheses on the Global City Tokyo,” *Long finance and London Accord Web Papers*, pp.1-18, <http://www.longfinance.net/component/longfinance/?view=report&id=548> (Accessed October 30, 2017)

Tanaka,H.(2016b) “The Sustainability Theorem in the ESG Mechanism,” *Long finance and London Accord Web Papers*, pp.1-29. <http://www.longfinance.net/component/longfinance/?view=report&id=558> (Accessed October 30, 2017)

Tanaka,H.(2018) Crypto Currency and Decentralized Provision of Trust, *The Journal of Economics: The Society of Economics in Chuo University*, Vlo.58, No 3 • 4, (Written in Japanese) in printing.

UNEP FI and UN Global Compact (2006) *Responsible investment and hedge funds: A discussion paper.* https://www.unpri.org/download_report/3972

(Accessed November 3, 2017)