

A Short Essay Regarding ‘Unified Growth Theory’ (2011) In Terms of Galor Oded

My primary question to Galor, Oded: His ‘*Unified Growth Theory*’ (here under, the *UGT*, for simplicity) is based on empirical facts, whose data come from national deficits and debts by country for two centuries or more, depending on each country’s conditions.

Why do I take the *UGT*? This is because the *UGT* stands at the extremely opposite side from the *EES* (2013, 1st ed.; 2014, 2nd ed.) and the *HEU* (2015) of mine. The basic idea of these two extremes is the same but, each methodology differs completely. For example, common ideas are: theory = practice and purely endogenous holding in the market principles. Then, how the two methodologies hold under these circumstances? This is because a few functions in one side are not used those in the other side at all, where no common parameters and variables, dependent and independent, are found in each extreme approaches. I respect his new discoveries for the *UGT*. Further, Galor is modest, sincere, and precise, as is surprisingly shown in Name Index and Subject Index at the end.

Then, the followings are respective differences of methodologies lying between the two approaches.

- (1) Human capital is exclusively used in the *UGT*, while human capital exclusively reinforces the *EES* and the *HEU* that are exclusively policy-oriented. In the *UGT*, it is never required to distinct policies with strategies. Attitude is reversed under the same market principles.
- (2) Physical capital is never used in the *UGT*, while physical capital is exclusively used in the *EES* and the *HEU*. In another way, either human capital or physical capital is used in each model, system, or approach; each data files and databases for the above items do not overlap at all. I envy his data, since tax authority data files are most reliable and easy to obtain, earlier and surely by country.
- (3) A system for national accounts (so called, the 93SNA) is not empirically tested in the *UGT*, while the 93, SNA is a base for tests after available in post-war periods, as clear from the original work on the 93SNA. As a result, flow- and stock-cash is indifferent in the *UGT*, while those are tightly connected with the *EES* and the *HEU*. In other words, the *UGT* is preferred to the *EES* and the *HEU*, in the viewpoint of perfect confirmation of tests.
- (4) Geometrically, concave and convex are simply expressed by parabola in the *UGT*, while hyperbola functions, symmetric, are exclusively expressed in the *EES* and *HEU*, where algebraic equations are immediately replaced by instant hyperbola figures.

The above differences were summed up, independently from Aoki, Masahiko (5 Jan., 2015)¹; bright bridge between the US and Japan. This is because Aoki also, like an academic magician, mixed the *UGT* with S. S., Kuznets's (1971) ideas of business cycles, so well (see, a short-essay regarding three Japanese economists).

Incidentally, Indexes of these two authors are enough contrasting.²

Conclusively, here this short essay points out the following three:

Firstly, the *UGT* does not use a Cobb-Douglas (C-D) production function. The C-D production function is one of most difficult academic tools. Galor himself must have tested (for measure and comparison) the C-D production function hitherto.³ Either or both before and after his challenging for a new production function of his own. Curiously, I desire to get his direct answer when time comes in the future.

Secondly, I envy his new endogenous mechanics of the structure of consumption, wholly prevailing in the *UGT*. His idea, discovery, and evidences are beyond description; connecting these with population, education, human capital, and various diversities. These correspond with my key points of national taste, preferences, culture

¹ See Aoki, Masahiko (Mar., 2014), 217-227, whose data source is Yomiuri Newspaper, 4 Jan., 2000, edited by Kunimatsu, Toru.

² Before touching conclusive remarks, I made a hand-writing list selected from Galor's Name Index and Subject Index. In his Name Index, for example, no names of Kaldor, Mirrlees, Pacinetti, Samuelson, nor Tobin but, names of Barro, Jones, C. I., Romer, P., Romer, D., Sala-i-Martin, Solow, and Taylor, A. In his Subject Index, I paid attention to: agriculture, comparative development, demographic transition, economic growth, education, evolutionary growth theory, human capital, income per capita. Malthusian, Epoch. Malthusian theory, poverty, stagnation, technology. Then, I selected 32 sub-titles and its page numbers each in '*Unified Growth Theory*' (ibid., 324-325) in Subject Index (ibid., 317-325).

Among 32 sub-titles above, I list my favorites by page numbers and sub-titles, as follows: **2.** p. 172-74, agricultural-industrial-transition; **5.** p. 150-51, 166, 168, budget constraints; **8.** p. 150, 154, 166, 168, 174-n33, 178, 185, child quality; **14.** p. 54, 140, 146-48, 161, 164, 166, 169-71, 175-78, 181-82, 189, 191, 199-204, 229-30, 228, demographic transition; **17.** p. 151-71, 174-78, 182-91, 194-99, 204-10, 213, 216, 219, 229-30, education; **18.** 140-41, 144, 166, 172n32, 180, 228, escape from Malthusian trap; **19.** 237-238, 278, evolutionary growth theory; **24.** p. 149-43, 146-52, 157, 166, 168-205, 209-10, 213-21, 228-30, human capital; **25.** 140-64, 161, 165-78, 179-82, 186, 189, 191, 184, 198-99, 203-4, 297-10, 213, 216, 219, 224-30, income per capital; **27.** p. 143-46, incompatibility of non-unified growth theories; **29.** p. 64, 142-45, 148, 157, 161, 164-66, 182, 220, 226-29, modern growth regime; **30.** p. 159-51, preference; **31.** 141-78, technology; **32.** 140-48, 164-66, 169-70, 173-81, 187, 193, 198-99, 202-3, 210, 213, 221, 228-29, sustained economic growth.

³ Galor actually raises Jones, C. I. in his Name Index, as seen in Note 2 above. Jones, Charles, I. (chapter 2, 1998) thoroughly and beautifully finalizes Solow's (1956) model, precisely with required assumptions, as Solow (ibid., p. 65) pointed out. Incidentally, their results are the same as the *EES* and the *HEU* that have each no assumption.

Historic Variety on the Earth

and civilization by country and area, which are endogenously independent of technological progress.

Thirdly, Galor and Kamiryo have proved ‘purely endogenous,’ by country, sector, year and over years, using similar characteristic countries, and exclusively and historically relying on evidences. This fact suggests us how interesting and attractive to compare respective rate of technological progress, differently from exogenous rate of technological progress in the literature. After publishing the *HEU*, summer 2015, I intend to focus on this comparability much more orthodoxly. Then, human capital and physical capital, flow and stock, are cooperatively evidenced for the first time in the literature.

As my acknowledgements in this short essay, I am delighted to be able to re-perceive the importance of assumptions have in the literature. How can we connect economic assumptions with results in economic models and systems? In this respect, I am much obliged to Jones, C. I. (chapter 2 The Solow model; pages 20-53, 1998). Jones is successful in disentangling the problem⁴ indispensable to the proposition of theory = practice.

References

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- Kuznets, S. (1971). *Economic Growth of Nations: Total Output and Production Structure*. Cambridge, Mass: Belknap Press of Harvard Univ. Press. 363p. (1901-1985; 1971, Nobel Prize).
- Piketty, Thomas. (2013; translated 2014). *Capital in the Twenty-First Century*. Cambridge, MA: translated by Arthur Goldhammer, Belknap Press of Harvard University Press.

⁴ Typically, the assumption of ‘perfect competition’ is ultimate one, which should not be used. Sorry for but, results using Modigliani, Franco, in the earlier 1950-60s need assumption of perfect competition. No one can directly solve this assumption, similarly to the case of Chapter 2 in Jones, C. I. (1998). Note, the *EES* and the *HEU* have no assumption respectively.

A Short Essay Regarding 21st Century by Thomas Piketty

My question commonly to anyone, economist and non-economist: What are the essentials lying between huge lines implicitly explained by Thomas Piketty's "Capital in the twenty-first century?"¹ ?

I feel, this book is an ever-lasting one that remains the best as based on the core of all the data analysis. There is no need for additional. I am thrown into strange magic. I feel dreamy: why and how did Piketty create such unique clod and, connected the clod with his mechanism as a whole. Charming work and historic literature, indeed!

All of data are able to cite by using his 'piketty.pse.ens.fr/capital21c' and also 'the online technical appendix.' It took fifteen years for Piketty's data-files to arrange for 'tax government data' among more than twenty countries, whose periods are more than three centuries. Piketty clarifies data collections and analytical methods so that we have WTID (<http://topincomes.parisschoolofeconomics.eu/>), as a result of more than thirty researchers' cooperation. His focus point is wonderful, as mentioned Columbus's egg in Japan and, worthy of more than force power.

Then, why am I inclined to write a short essay for Piketty's results?

My research for macro and micro economics remains the use of KEWT database series, 9.15; GDP-based, 1960/90-2012, in A System of National Accounts (93, SNA). In the case of GDP-based, my database is one of statistics database. It implies that any data-file is able to compare with my database 9.15. Why? This is because actual/ex-post data are always within a certain range of purely endogenous database of mine. Thus, all the data-files or databases improve harmoniously with each other. I expect, first of all, Piketty's data will deepen and widen his mechanism, cooperatively with mine.

Of course, any one cannot make others to co-operate each other, since any one has her/his own ideas and originals with pertinent and methodologies. At the same time, we shall find true essence, commonly to all and any of theory, practice, culture,

¹ In detail: 2014, the Belknap Press of Harvard University Press, Cambridge, Mass, London, England. viii+685p, translated by *Arthur Goldhammer*. This book I have is luxury and beautifully printed in the USA, with black cover vertically two designed (by *Dean Bornstein*), front and back, and; binding, thin bright red, top and bottom. First published, as *Le capital au XXI^e siècle*; 2013 Editions du Seuil.

Translated to Japanese (Dec 2014) by three; Hiroo Yamagata, Sakura Morioka, and Seishi Morimoto. Tokyo: Misuzu Shoho. 98+608p., well designed similarly to English version. There are two silver sub-titles on the white front cover and also back cover: (1) $r > g$; when the rate on capital is greater than income growth, capitalism automatically produces arbitrary and unsustainable inequality: and (2) A unique purpose of this book is to draw moderate keys towards future from the past.

Historic Variety on the Earth

civilization, history, reproducibility, perfect competition, fair deregulation, democracy, and peaceful philosophy, as shown algebraic and geometric.

What are the essence and its concrete essentials existing between numerous facts and discoveries in the actual world?

In the case of Piketty's capital, several targets are found by aspect. For example, plan-do-see or learning by doing for stop-inequality: how to make democracy cooperative with capitalism; how to measure the rate of return on capital, cooperatively the real assets with the market/financial assets; no inconsistency between just before redistribution of all the taxes and simultaneously just after redistribution of all the taxes; size of government; value added and non-value added and so on.

I do not compare Piketty's proposals/hypotheses with those of others in this short essay. Or, my essay here is independent of other essays of mine. My intention here is to confirm common essence and present possible solutions. Yes, answer must be connected with true solutions. For example, can a proposal to stop macro-inequality truly reduce the macro-inequality to its moderation?

Yes, moderation here shows a countless spot where we human cannot approach in reality. Moderation is defined as an origin in the two-dimensional plane. The origin is Nature or God. However, we human is able to approach 'closer to Nature.' We human has used money for the last several thousand years, BC. Human money is another expression or the market principles. The market principles are essentially 'next to Nature,' where price (quality) and quantity are one by goods and/or services.

Then, what does this mean by 'beyond space and time'? This may constitute an answer to the essence of Piketty's 21st century. Piketty expect we improve further step by step in his book, although he confesses that it is difficult to find a solution today. No, It is next to impossible for us to find an answer and further a solution under the market principles. Why?

Only if we find an organic system as a whole in our societies, we find the answer and solution s well. The market principles are immediately alive vividly by getting horizontal space and time and, horizontal is replaced by an organic system which connects vertical with horizontal. Is this available in reality? Yes, an organic system solves all the difficulties. How can we confirm this fact in reality?

Image the two dimensional plane geometrically. This image, design, or diagram is generally scientific. We, using social sciences, do not fly over three, four, or further, five and six at all, differently from natural sciences or, physics and chemicals. We confirm and prove an organic system by watching the existence of symmetry. In the literature, we are accustomed with asymmetry. But, solely in hyperbola we find symmetry between the 1st and 3rd quadrants or, the 2nd and 4th quadrants.

Hideyuki Kamiryo

Numerous economic (macro and micro), equations without respective assumptions for equations' justification are calculated algebraic, while geometric symmetry is immediately observed with no calculation under the same market principles.

This essay is composed of three: (1). Data-source arrangements, which I selected among Piketty's Notes; (2). Several short reviews summed up by Nozomu Nakaoka, in a Japanese journal of '*the Economist, Tokyo*'; (3). Conclusions intuitively using my own ideas and experiences for 65 years. I do not directly compare these conclusions with my three books, Toronto, and my papers published by two journals of my university. Neither do I refer to my equations, tables, and figures in my essay here. For readers who do not read this book, I cite his large contents as a note.²

Lastly, I write some comments beforehand here. Capital, flow (net investment after economic depreciation) and stock (total factor productivity), the capital-output ratio, the rate of return/profits, and GDP growth are basic items, found commonly to Piketty' and Kamiryo, ' apart from ex-ante measure possibility.

In particular, the Cobb-Douglas (C-D) production function and, a constancy of the capital-output ratio earlier mathematically proved by Paul A. Samuelson (1938, 1939, 1941, 1942, 1965, 1970) are my two treasures in my life-work for the last sixty five years; strange to say, incidentally challenging for hyperbola, year by year. In this sense, I am most interested in chapters 1, 3, 6 and also Notes 17-23 in chapter 6, pages 599-600, for the Cobb-Douglas (C-D) production function. In short, I fell excited as if I could meet a visitor from space or, an alien on this earth.

² Large classification of titles by chapter

Introduction

1. Income and output
2. Growth: illusions and results
3. The metamorphoses of capital
4. from old Europe to the new world
5. The capital/income ratio over the long run
6. The capital-labor split in the twenty-first century
7. Inequality and concentration: preliminary bearings
8. Two worlds
9. Inequality of labor income
10. Inequality of capital ownership
11. Merit and inheritance in the long run
12. Global inequality of wealth in the twenty-first century
13. A social state for the twenty-first century
14. Rethinking the progressive income tax
15. A global tax on capital
16. The question of the public debt

Conclusion

Notes, Contents in detail, List of Tables and Illustrations, Index

Historic Variety on the Earth

(1). Data-source arrangements selected by the author (Kamiryo)

1-1 My remarks in chapter 6; Notes 17-23, pages 599-600, for the Cobb-Douglas (C-D) production function

1. **Note 17:** It can be shown that the C-D production function takes the mathematical form $Y = F(K, L) = K^\alpha L^{1-\alpha}$, where Y is output, K is capital, and L is labor. There are other mathematical forms to represent the cases where the elasticity of substitution is greater than one or less than one. The case of infinite elasticity corresponds to a linear production function: output is given $Y = F(K, L) = rK + vL$ (so that the return on capital r does not depend on the quantities of capital and labor involved, nor does the return on labor v , which is just the wage rate, also fixed in this example). See the online technical appendix.
2. **Note 18:** See Charles Cobb and Paul Douglas, "A Theory of Production," *American Economic Review* 18, no. 1 (March 1928): 139-65.
3. **Note 19:** According to Bowley's calculations, capital's share of national income throughout the period was about 37 percent and labor's share about 63 percent. See Arthur Bowley, *The Change in the Distribution of National Income, 1880-1913* (Oxford: Clarendon Press, 1920). These estimates are consistent with my findings for this period. See the online technical appendix.
4. **Note 20:** See Jürgen Kuczynski, *Labour Conditions in Western Europe 1820-1935* (London: Lawrence and Wisharr, 1937). That same year, Bowley extended his work from 1920: see Arthur Bowley, *Wages and Income in the United Kingdom since 1860* (Cambridge: Cambridge University Press, 193). See also Jürgen Kuczynski, *Geschichte der Lage der Arbeiter unter dem Kapitalismus* 38 vols. (Berlin, 1960-72). Volumes 32m 33m and 34 are devoted to France. For a critical analysis of Kuczynski's series, which remain a valuable historical source despite their lacunae, see Thomas Piketty, *Les hauts revenus en France au 20e siècle: Inégalité et redistribution 1901-1998* (Paris: Grasset, 2001), 677-681. See the online technical appendix for additional references.
5. **Note 21:** See Frederick Brown, "Labour and Wages," *Economic History Review* 9, no. 2 (May 1939): 215-217.
6. **Note 22:** See J. M. Keynes, "Relative Movement of Wages and Output," *Economic Journal* 49 (1939): 48. It is interesting to note that in those days the proponents of a stable capita-labor split were still unsure about the supposedly stable level of this split. In this instance Keynes insisted on the fact that the share of income going to "manual labor" (a category difficult to define over the

Hideyuki Kamiryo

long run) seemed stable at 40 percent of national income between 1920- and 1930.

7. **Note 23:** See the online technical appendix for a complete bibliography.

1-2 My remark in chapter 6; Note 24, page 600, for $\eta > 1$

8. **Note 24:** See the online technical appendix.

1-3 My remark in chapter 6; Notes 25 and 26, page 600, for human capital

9. **Note 25:** This might take a form of an increase in the exponent $1-a$ in the C-D production function (and a corresponding decrease in a) or similar modifications to the more general production functions in which elasticities of substitution are greater or smaller than one. See the online technical appendix.

1-4 My remark in chapter 6; Notes 26-30, page 600, for relative share, α

Note 26: See the online technical appendix.

Note 27: See Jean Bouvier, François Furer, and M. Gilet, *Le mouvement du profit en France au 19e siècle: Matériaux et études* (Paris: Mouton, 1965).

Note 28: See François Simiand, *Le salaire, l'évolution sociale et la monnaie* (Paris: Alcan, 1932); Ernest Labrousse, *Esquisse, du mouvement des prix et des revenus en France au 18e siècle* (Paris: Librairie Dalloz, 1933). The historical series assembled by Jeffrey Williamson and his colleagues on the long-term evolution of land rents and wages also suggest an increase in the share of national income going to land rent in the eighteenth and early nineteenth centuries. See the online technical appendix.

Note 29: See A. Chabert, *Essai sur les mouvements des prix et des revenus en France de 1798 à 1820*, 2 vols. (Paris: Librairie de Médicis, 1945-49). See also Gilles Postel-Vinay, "A la recherche de la révolution économique dans les campagnes (1789-1815)," *Revue économique*, 1989.

Note 30: A firm's "value added" is defined as the difference between what it earns by selling goods and services (called "sales revenue" in English and what it pays other firms for its purchases (called "intermediate consumption"). As the name indicates, this sum measures the value the firm adds in the process of production. Wages are paid out of value added, and what is left over is by definition the firm's profit. The study of the capital-labor split is too often limited to the wage-profit split, which neglects rent.

1-5 My remark in chapter 6; Notes 31-34, pages 600-601, for Marx

Note 31: The notion of permanent and durable population growth was no clearer, and

Historic Variety on the Earth

the truth is that it remains as confused and frightening today as it ever was, which is why the hypothesis of stabilization of the global population is generally accepted. See Chapter 2.

Note 32: The only case in which the return on capital does not tend toward zero is in a “robotized” economy with an infinite elasticity of substitution between capital and labor, so that production ultimately uses capital alone. See the online technical appendix.

Note 33: The most interesting tax data are presented in appendix 10 of book I of Capital. See the online technical appendix for an analysis of some of the calculations of profit shares and rates of exploitation based on the account books presented by Marx. In *Wages, Price, and Profit* (1865) Marx also used the accounts of a highly capitalistic factory in which profits attained 50 percent of value added (as large a proportion as wages). Although he does not say so explicitly, this seems to be the type of overall split he had in mind for an industrial economy.

Note 34: See Chapter 1.

1-6 My remark in chapter 6; Notes 35-36, for two Keynesians

Note 35: Some recent theoretical models attempt to make this intuition explicit. See the online technical appendix.

Note 36: To say nothing of the fact that some of the US economists (starting with Modigliani) argued that capital had totally changed its nature (so that it now stemmed from accumulation over the life cycle), while the British (starting with Kaldor) continued to see wealth in terms of inheritance, which was significantly less reassuring. I (i.e., Pikrty, here) return to this crucial question In Part Three.

1-7 My remark in chapter 10; Note 24, 25, and 26, page 614, for $r = g$, $r < g$, (and also, $r > g$, in the *EES* and the *HEU*)

Note 24: See Pierre Rosanvallon, *La soci   des  gaux* (Paris: La Seuil, 2011), 50.

Note 25: The equation relating the Pareto coefficient to $r-g$ is given in the online technical appendix.

Note 26: Clearly, this does not imply that $r > g$ logic is necessarily the only force at work. The model and related calculations are obviously a simplification of reality and do not claim to identify the precise role played by each mechanism (various contradictory forces may balance each other). It does show, however, that the $r > g$ logic is by itself sufficient to explain the observed level of concentration. See the online technical appendix.

(2). Several short reviews summed up by Nozomu Nakaoka, in a Japanese journal of *'the Economist, Tokyo'*

To know fast response in Japan, I investigated Piketty's reviews and comments written in Japanese, staying at my University-Library and, as many as possible. Among others, I selected *'the Economist, Tokyo.'* And, I watched one page review-collections written by Nozomu Nakaoka. The title is 'important book but too simple: being busy Yes or No in the US.' I translate this one page into English by my own responsibility and, based on my own experiences so that I must communicate with Nozomu Nakaoka, Tokyo; before I publish this essay and, after consulting this matter with my friend and Editor-in- Chief, Yisheng Huang, Better Advances Press, Toronto.

At first, I intended to collect pertinent diagrams or short summing up sentences. However, I failed this attempt. Each summing up is too vertical, from different aspects and various points of view; it was difficult to collect due to too simple. I looked for more widely and deeply or, more to the point of essence. I do not like transitory but moderation (see page 2 above). Further, I respect Robert Solow as one of my few benefactors abroad with Paul Samuelson, since 1973/74 as a Sloan Fellow; among reviewers collected by Nozomu Nakaoka. Besides, I like Krugman, Stieglitz, and Gates as founder of MS. I confess, without the Excel I have not complete my own database, GDP-based for 86 countries, 1960/90-2012, which is easy to compare and reinforce all the data-files and databases in the world.

2-1 Paul Krugman:

Highest praise; fitting most important point for the last ten years, by adding magnificent and bold observation and discussions regarding the poverty. I need Krugman's comments on my next book, Toronto, shaking hands and delivering the book. I am always, every month, reading his NY Times column, English and Japanese.

2-2 Joseph Stieglitz:

Favorable evaluation on this book; Yet, with Stieglitz's proposals such as factor is not from $r > g$ but the enlargement of excess windfall profit under oligopoly so that we must solve the problems of regulatory flexibility that provides preferential treatment for rich people, the increase in directors' earnings, and weakened labor unions.

I advocate perfect competition under the market principles so that I accept his proposals sincerely and straightforwardly.

2-3 Robert Solow:

Favorable evaluation on this book; Yet, Solow clearly indicates, 'do not confuse wealth with capital.' Piketty forecasts; the capital-output continues to increase and, the

Historic Variety on the Earth

world economy returns back to the 19th century's condition. Solow also asks; what determines the capital-output ratio in a long run?

I am pleased to know that he is vividly alive even after retirement. Every morning and night, I look at his memorial post-letter after publishing the *EES*, 2013. I am sure, in this fall, I could visit and shake hands with Patricia and Alan White, Cape Code, Mass, soon after I meet Yisheng in Toronto.

2-4 Richard Allen Posner and Glenn Vaile:

Too much simple; right solution is not for increasing taxes to rich people but more spending various social energies towards productive activities.

This severe comment is appropriate since answer must be surely practical by learning by doing.

2-5 Emanuel Derman:

Cold against this book; indifferently, not to inclined to read at all, as a specialist in financing at Columbia.

I am eager to digest Derman's most-cited book in spring after finishing proof-reading. I respect Barro's student, Xavier Sala-i-Martin, Columbia, due to similar field researches, apart from the difference between exogenous and endogenous. In 1960-61, as a trainee of Chemical Bank, I lived next door to Columbia, attending at night school of Columbia, I recollect this fact suddenly.

2-6 Bill Gates:

Some agreement on this book; Gates raises two essential defects as a businessman.

- (1) It is irrational to explain the enlargement of poverty solely by the difference between return on capital and GDP growth.
- (2) Progressive taxation should be not for capital but for consumption and, Gates accepts inheritance tax, similarly to Piketty.

2-7 Nozomu Nakaoka, himself:

Nakaoka leaves a question why did Piketty currently create a furor in the American society so much? Nakaoka concludes; generous Americans feel the changing consciousness through social movements and public campaigns. Some may be afraid of the decrease in American dream moving up to a higher class.

I feel: we need strategies vertically but, we should not be afraid of vital economic policies at all. This is because actual ex-post data and results are always within a certain range of purely endogenous data and also, with ex-post = ex-ante and results = causes; beyond space and time, as repeatedly stated.

(3). Conclusions intuitively using my own ideas and experiences

My organic system is based on the Cobb-Douglas (C-D) production function, with an axiom, i.e., a constant capital-output ratio (*Omega*-const.). Origin of *Omega*-const. comes from Samuelson's mathematical proof (1970), as the constancy of the capital-output ratio. Therefore, I am most interested in the C-D production function so that I cited Piketty's related paragraphs in Chapter six and its Notes 17-23 (ibid., 217-234; 599-600), as shown in this essay above.

The C-D production function in the literature is never fitted for an organic system as a whole. Why? We need a hidden parameter, δ_0 , which is equal to the relative share of capital, α , in a case when the C-D production function converges in a long run. I define this point of time as the convergence year, where $\alpha = \delta_0$. After this point of time, the convergence-curve does either going up or approaching zero, over years.

Let us turn back to an inequality of ' $r > g_{GDP}$ ' in a closed system, as shown by Piketty's hypothesis. Is this generally replaced by another equation? Yes. ' $r > g_{GDP}$ ' is replaced by $r = r^* = r_0 = \text{the coefficient of convergence} \times g_{GDP}$, where the coefficient of convergence is $(\alpha / i_{net} \cdot \beta^*)$. Output is purely endogenous and measured by Y , where $Y = C + S = W + P$, with no assumption, results = causes, and ex-ante = ex-post. The technology coefficient is $\beta^*(i_{net}, \alpha, g_{population}, \textit{Omega})$, and as a result, ' $r = g_{GDP}$ ' holds if there is no technological progress, α being equal to net investment INET divided by Y . Piketty's case solely shows $(\alpha > (i_{net} \cdot \beta^*))$.

Furthermore, capital as the real assets in a system of national accounts (93, SNA) calculates double-bookkeeping accounts but, this calculation is meaningless in an organic system. Why? Solely, by an axiom of *Omega*-const.(see above). This proof and evidences are directly related to intellectual property for averaged capital-output ration so that I shall fairly clarify at the timing when the software-patents are opened and after publishing the *HEU* (July, 2015).

It is quite natural that Piketty could not clarify what core should be opened. It is not his responsibility at all, under the vertical market principles. A whole economic systems is only solved by using purely endogenous, where a specific C-D production function is deeply and delicately involved.

Now readers understand why I arranged for Piketty's data files and related Notes in this essay. Purely endogenous solves all economic analyses by using KEWT 9.15 in parallel with any data files and databases in the world today. Macro-inequality does not spread, with no inflation/deflation, whose true cause is huge deficit and no others.