Chapter 4

Consumption-Neutral to Growth and Technology: Actual *versus* Endogenous

1. Introduction:

With brief comparisons between actual and endogenous

This chapter develops and proves independent relationships between consumption and technological progress by country and, proposes a unique policy empirics-method to test those relationships. The policy empirics-method makes five consumption-neutral indicators, five policy-combinations, and three policy-priorities, to test actually. When consumption and technological progress are given exogenously or externally as observed in the literature, it is difficult for policy-makers to cyclically execute and evaluate and test all the economic policies by year and over years. This chapter aims at conquer this difficulty, reinforced by entirely policy-oriented endogenous system.

Consumption wholly shows national peculiar characteristics by country, as shown by preferences, national taste, culture, and history. Technological changes in the literature are here accurately measured by an endogenous rate of technological progress. Purely endogenously, the endogenous-equilibrium has no assumption and as a result, holds under perfect competition. Any model is incomplete if externalities and exogenous are included partially. Exogenous is indispensable when the price-equilibrium and its market principles prevail over the world and over years. This is because the market principles vertically (by price) hold by good, service, and software. The markets always show various results intuitively like God but, clarifying no relationship between causes and effects/results. Consumption-neutral, however, prevails by economy, independently of technological progress; regardless of national system, democratic and autocratic, and even at several Arabians that have no market principle.

One of typical differences between the literature and the "*Earth Endogenous System*" (the *EES* hereafter; the 1st Ed. 2013; the 2nd Ed., 2013) is traced back to the difference between a system for national accounts (the SNA, 1993, 2008) and the KEWT database. The SNA aims at records while the KEWT database[1] aims at plan-do-see policy functions.

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[1] The *EES* (ibid.) unites theory and practice, where theory is the endogenous system while practice is the KEWT database. The KEWT database series take 10 original data from the real assets of *International Financial Statistics Yearbook* (*IFSY*), IMF, and 15 original data from the financial/market assets of the *IFSY*.

The KEWT database series have accumulated endogenous data by country and by year, starting Version 1.07 in 2007 to Version 7.13 in 2013, and currently, 9.15 in 2015. The 9.15 publishes 1960/90 -2013 yearly data for 65 countries.

We stress that both systems are indispensably required and work cooperatively by country, sector, area, and city, regardless of each size. In fact, the market principles are numerically integrated with the endogenous system and its KEWT database. Sector data in the endogenous system are defined as endogenous amounts each at the government (G) sector and the private (PRI) sector and, the aggregative total (T) economy. Economists perceive the principle of three equivalency of 'national disposable net income= expenditures=products'; $Y = C + S = W + P$. The market principles and absolute prices by goods, however, make it difficult to activate this equation correctly.

Accurately the endogenous system measures each of consumption, saving, wages, and returns, contained in $Y = C + S = W + P$, completely based on the real assets. Why accurately? The absolute price level, P by goods, is always replaced by the relative price level, p=1.0000000,[2] by country, sector, and year and over year. It implies that the real assets is respectively shown by quality=quantity or by money magnitude. Money in the literature is applicable to the real assets commonly all over the countries and with the exchange rate between two countries. The endogenous system is essentially based on the real assets yet, shown by such money as Money unit of quality=1.0000000. As a result, each sector is tied up with the structure of the balance of payments, $BOP = \Delta D + (S_{PRI} - I_{PRI})$. Accordingly, deficit, ΔD, is measured and connected with the whole real assets, apart from one alternative of cash flow-in and -out at the government (G) sector.

The SNA is shown by households and enterprises after tax redistribution. As a result, returns/profits at the Gt sector are not estimated wholly as a system. Enterprises supposedly absorb minus returns at the G sector. With huge deficits and debts, an endogenous rate of return at the G sector is significantly negative, which accurately offsets positive profits at the private (PRI) sector. The financial and exchange-rate markets intuitively know these surprising results and are afraid of default and bankruptcy of national debts accumulated. Remind us the money-neutral of the financial/market assets to the real assets remains unchanged ten decades or more. Differences between actual data and endogenous data express the levels of risk-aversion and are sensitive to default by country. Moreover, the rate of return is directly related to the growth rate of output. Phelps' (1961, 1965) golden rule externally holds by the growth rate=the market rate of interest. Also, adverse relationship holds between the rates of change in population and technological progress. These were cultivated in the *EES* (ibid.) so that this chapter does not discuss.

[2] This chapter does not refer to relationships between the relative and absolute price levels; the Phelps endogenous coefficient; marginal productivity theory with $MPK = r$ and $MPL = w$; and, the real rate of return=0 (simply, *RRR*=0). These discoveries are geometrically interrelated and separately included in this book.

This chapter is organized as follows. *The First* summarizes essentials of preferences and technological progress. *The Second* measures three sorts of neutrality; Hicks (1932), Solow (1956), and Harrod (1939). *The Third* is How to test relationships between preferences and technological progress. *The Fourth* is Consumption-neutral indicators and policy-combinations for evaluating preferences and technological progress. *The fifth* is Test results by country and policy empirics-method found commonly to countries.

2. Essentials of preferences and technological progress

The First briefly explains related equations with backgrounds and implications. Why are preferences independent of technological progress both in the literature and the endogenous system? Each background completely differs. In the case of the literature, preferences and technological progress are externally given. Why externally? It is because the rate of technological progress is given externally. Why is it given? The Cobb-Douglas production function has a key to open the door to endogenous but not formulated yet. Why? It is because hidden parameters are not discovered in the Cobb-Douglas production function. Instead, some articles assert that the rate of technological progress is estimated endogenously using human capital and education and so on. Our question to the above assertion is: what sorts of assumptions do these articles list up as surrogate or excuse for justifying equations? Do readers meet an article to formulate all the possible hundred equations without any assumption? Equations with many fundamental assumptions remain 'partial' since it cannot clarify its universal version to connect all the parameters with all the variables simultaneously in a whole system and over years. The current econometrics uses complicated matrices instead of models, equations, and assumptions. Matrices has its own problem of $\boldsymbol{AB \neq BA}$ while purely endogenous, never.

Backing to the Firth's stream, the *EES* has no assumption and starts with measuring the rate of technological progress accurately with no assumption as a whole system and over years. No assumption implies that all the parameters and variables are measured accurately and consistently over years, with no exogenous, no external, and simultaneous causes-results. Once measured, no adjustments later unless the original data is revised. It implies that the marginal productivity of capital equals the rate of return and, the marginal productivity of labor equals the wage rate and that as a result perfect competition is simultaneously measured. These results measured hold regardless of whether the endogenous-equilibrium falls into a moderate range or not. The literature must presuppose a moderate range of equilibrium or well-behaved production functions. The literature must rely on growth accounting, differential/integrate, probabilities, correlation coefficients, and any possible other devices in the continuous time while data and statistics are discrete.

The core of relationships between the rate of technological progress (FLOW) and

total factor productivity *TFP* (STOCK) is the investment qualitative coefficient (simply, the technology coefficient, β^*) at a convergence point of time in the transitional path using recursive programming or directly from KEWT's equations. In the transitional path, the initial value of the capital-output ratio is equal to the capital-output ratio on the convergence point of time, as mathematically proved by Samuelson (1970) and later ultimately proved by R. Sato (1980) in a von Neumann closed system. At this point, the technology coefficient $\beta(t)$ turns to β^*. The capital-output ratio shows $\Omega = \Omega^* = \Omega_0$. As a result, under a fixed relative share of capital,$\alpha = \Omega \cdot r = \Pi/Y$, the rate of return, $r = \Pi/K$ and $r = r^* = r_0$ hold. The endogenous- equilibrium is directly measured by the speed years as the inverse of the sped coefficient, λ^*.

$g_A^* = i(1-\beta^*)$ is composed of net investment (after capital consumption) to output, $i = I/Y$, and the technology coefficient, β^*. The higher the $i = I/Y$ the higher the g_A^* is. And, the higher β^*, the lower the rate of technological progress g_A^* is.[3] Endogenously $i = I_G/Y + I_{PRI}/Y$ holds. Suppose that the balance of payments is given as it is. Then the net investment difference between the G sector and the PRI sector negatively equals the saving difference between the G sector and the PRI sector. When the rate of return at the G sector is extremely negative as in Japan, $i = I/Y$ is extremely low, being offset by the G sector. This is a phenomenon of so called crowding-out. Net investment is never controlled by financial and fiscal policies. This chapter does not refer to $i = I_G/Y + I_{PRI}/Y$ any more here; i) quantitative magnitude as shown by amount and, ii) qualitative difference as shown by the technology coefficient, $\beta, \beta(t), \beta^*$.

The technology coefficient, β^*, is now a target of technological changes. The other target is preferences. Preferences are measured uniquely in the endogenous system. Economists are anxious about the future of preferences by country due to the current global economies in the world. The endogenous view stands at the opposite side. Preferences hold independently and strengthen the robustness of economic policies and results. Preferences and technological changes are compatible enough even in globalization. This is a gift from Nature and endogenous.

How preferences are measured? First of all, individual-utility in the literature is replaced by macro-utility. Macro-utility is express as $(\rho/r)(C/Y)$, where the propensity to consume is $c = C/Y$ and (ρ/r) is the relative discount rate of consumer goods and producer goods. Underlying mechanics is summed up: $(1-\alpha) = \frac{c}{(\rho/r)}$ and, $\frac{K}{L} = \frac{(\alpha/(1-\alpha)}{(r/w)}$ or $k = \frac{w \cdot \Omega}{1 - r \cdot \Omega}$. The capital-labor ratio prevails in the literature but, the capital-output ratio is much more technology-oriented. $(\rho/r)(c)$ reflects national taste, preferences, culture, and history and is responsible for consumption level commonly by

[3] At the convergence point of time, any growth rate turns to zero, due to $\delta_0 \to \alpha$ and $\beta^* = 1.0$.

country. The KEWT database applies $13.301c^2 - 22.608c + 10.566$ to almost all the countries, commonly by country. Exceptionally, $1.8638c^2 - 2.4547c + 1.758$ is applied to some saving-oriented countries, regardless of autocratic or not.

Final stage after tax-redistribution indicates that households/people spends consumer goods wholly as a country while enterprises serve producer goods similarly as a country. This fact is true as shown in the literature. Just before tax-redistribution, however, the circumstances definitely differ. This shows one of essentials of the endogenous system. How differs? The literature follows two-sector model, consumer and producer and justifies the model under the market principles. Contrarily, the endogenous system constitutes one commodity model. Why? The relative price level, p=1.0000000, was measured everywhere by year. The elasticity of substitutions, $\sigma = \frac{-\Delta k/k}{\left(\Delta\left(\frac{r}{w}\right)\right)/\frac{r}{w}}$, presents an answer to the question. The σ sharply fluctuates by country, by year and over years, in the KEWT database by country. In the transitional path by year, however, the σ is exactly equal to 1.0000000, theoretically and empirically. The literature has to assume levels of the σ in the models or in econometrics analyses since the literature cannot either estimate or measure the σ. The markets intuitively judge σ's levels with expectations.

Then, how do readers interpret endogenous relationship between preferences and technological changes? Endogenously preferences are independent of technological progress. Consumer goods are spent independently and producer goods are served independently. Yet both goods are overwhelmingly united to one goods at the real assets. These characteristics related to preferences and technological progress give policy-makers an important key to open relationships between actual statistics data and endogenous data. Policy-makers are able to promote national taste and culture as much as possible and as a result, a country may obtain sustainable growth within a certain level of deficit. Seven endogenous parameters determine the results. Lucas's critique (1976) is fully taken into consideration as long as economic policies are within controllable hands of policy-makers. All the policies are determined by seven endogenous parameters and, these policies are reinforced by strategies in reality. And, relationships between seven endogenous parameters and strategies are yet unknown, just like the case of the market principles. Nevertheless, because of the existence of seven endogenous parameters, we are optimistic since leaders and policy-makers are able to definitely shorten the distances between actual and endogenous data by country, sector, and years and over years.

3. Three sorts of neutrality:

Starting with Hicks (1932), Solow (1956), and Harrod (1939)

The Second: Focusing an endogenous rate of technological progress is measured by $g_{A(FLOW)} = i(1-\beta)$, simultaneously with the growth rate of capital stock as total factor

productivity (*TFP*), $g_{TFP(STOCK)} = k^{1-\alpha}/\Omega$.[4] Our C-D production function is 'discrete' and all sorts of possible parameters and variables are measured simultaneously with *seven endogenous parameters*. *The Second* develops relationships between the rate of technological progress (FLOW) and total factor productivity *TFP* (STOCK), starting with $g_{A(FLOW)} = i(1-\beta)$.

Relationships between the rate of technological progress and total factor productivity *TFP* are empirically clarified starting with Hicks (1932), Solow (1956), and Harrod (1939):

(1) Tech-FLOW: the rate of technological progress, *m*

Set Hicks' $m = g^*_{A(FLOW)}$. Then, Solow's, $m(1-\alpha)$. Harrod's, $m \cdot \alpha$. As a result, $\text{Hicks}' g^*_{A(FLOW)} = Slow's\ g^*_{A(FLOW)} + Harrod's\ g^*_{A(FLOW)}$. The relative share of capital determines three differences for an endogenous rate of technological progress, $g^*_{A(FLOW)} = i(1-\beta^*)$.

(2) Tech-STOCK: Total Factor Productivity (*A*=*TFP*)

Set Solow's $A = TFP$ $\text{Hicks}' g^*_{A(TFP)} = \text{Slow}'\text{s}\ g^*_{A(TFP)} \ll \text{Harrod}'\text{s}\ g^*_{A(TFP)}$.

For total factor productivity (*TFP*), $\text{Harrod}'\text{s}\ g^*_{A(TFP)}$ is empirically much higher than $\text{Hicks}' g^*_{A(TFP)} = \text{Slow}'\text{s}\ g^*_{A(TFP)}$. Why is Harrod's *TFP* higher than those of Hicks and Solow? It is perfectly proved by an identity of Kamiryo (Note 5, 2003), $A = TFP = k^{1-\alpha}/\Omega$.[5] The capital-output ratio is much lower than the other two of Hicks and Solow. Why is $\text{Slow}'\text{s}\ g^*_{A(TFP)}$ the same as $\text{Hicks}' g^*_{A(TFP)}$? This is because the identity of $k^{1-\alpha} = A \cdot \Omega$ always holds under Hicks' $Y = F(AK, AL)$ and Solow's $Y = F(AK, L)$.

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[4] 1. Endogenous net investment to endogenous net income, $i = I/Y$.
2. The rate of change in population, $n_E = n$.
3. The relative share of capital, $\alpha = \Pi/Y$, where $\alpha = \Omega^*/r^*$.
4. The capital-output ratio, $\Omega^* = K/Y$, (or, $\Omega^* = \frac{\beta^* \cdot i(1-\alpha)}{i(1-\beta^*)(1+n)+n(1-\alpha)}$).
5. The technology coefficient (or the quantitative net investment coefficient), β^*, or, $\beta^* = \frac{\Omega^*(n(1-\alpha)+i(1+n))}{i(1-\alpha)+\Omega^* \cdot i(1+n)}$.
6. The diminishing returns to capital (DRC) coefficient. $\delta_0 = 1 + LN(\Omega^*)/LN((1-\beta^*)/\beta^*)$.
7. Speed years for convergence, $1/\lambda^*$, the speed coefficient, $\lambda^* = (1-\alpha)n + (1-\delta_0)g^*_A$, and $g^*_A = i(1-\beta^*)$.

[5] Partial differentials calculated by the Cobb-Douglas production function differ from $\frac{\partial Y}{\partial A} = 1.00000$ or *A*=*Y* here.

1. Hicks': $\frac{\partial Y}{\partial A} = K^\alpha L^\beta = 1L\left(\frac{K}{L}\right)^\alpha$, where partial difference is 1.0000 under $1 = \alpha + \beta$.
2. Solow's: $\frac{\partial Y}{\partial A} = \alpha A^{\alpha-1} K^\alpha L^\beta = 2A^{\alpha-1} L\left(\frac{K}{L}\right)^\alpha$, where partial difference is $2A^{\alpha-1}$ under $1 = \alpha + \beta$.
3. Harrod's $\frac{\partial Y}{\partial A} = \beta A^{\beta-1} K^\alpha L^\beta = \beta A^{\beta-1} L\left(\frac{K}{L}\right)^\alpha$, where partial difference is $\beta A^{\beta-1}$ under $1 = \alpha + \beta$.

4. How to test relationships between Preferences and technological progress

The third empirically researches endogenous relationships between preferences and technological progress, using the KEWT database by country, sector, and years and over years. We apply the KEWT database to the propensity to consume and the relative discount rate of (ρ/r), and also, to the technology coefficients by sector, $\beta^*, \beta_G^*, \text{and } \beta_{PRI}^*$. As a result, leaders and policy-makers are able to utilize three policy-priorities in policy empirics-method competitively and cooperatively in the global economies.

For preferences, why are two indicators, $c = C/Y$ and (ρ/r), selected among others? Consumption, $C = C_G + C_{PRI}$, is one of several key indicators given as statistics data. National disposable net income, Y, is endogenous so that the propensity of consume is endogenous. The relative discount rate of consumer goods and producer goods, (ρ/r), is endogenous. Values of (ρ/r) is exceptionally calculated using $(\rho/r)(c)$ in the database by country. These data are originally independent of seven endogenous parameters, except for the rate of return, $r = \Pi/Y$. It implies that $c = C/Y$ and (ρ/r) are essentially independent of other parameters and variables and yet connected with other parameters and variables, through $r = \Pi/Y$.

For technological progress, why are three technology coefficients, $\beta^*, \beta_G^*, \text{and } \beta_{PRI}^*$, selected among others? Earlier R. Solow (1957) expressed the corresponding ratio in an aggregate production function exogenously, soon after R. Solow (1956). The rate of technological progress is a base for all the other parameters and variables, except for two indicators related to preferences. Most important is dynamic balances between the G and PRI sectors by year. The dynamic balances determine controllable levels of the endogenous system by country according to moderate range of the speed years measured by country and by sector. $\beta^*, \beta_G^*, \text{and } \beta_{PRI}^*$, show a core of endogenous controllability most typically. The $c = C/Y$ and (ρ/r) are connected with $\beta^*, \beta_G^*, \text{and } \beta_{PRI}^*$, most effective and efficient, satisfying the Lucas' critique for policy changes by year.

5. Consumption-neutral indicators and policy-combinations for Evaluating preferences and technological progress

The Fourth summarizes *five* policy-combinations based on *five* consumption-neutral indicators. Five consumption-neutral indicators and five policy-combinations are shown by two lines in parallel as follows (also see **Figure 1** with **Table 1**):

C1. $c = C/Y$	C2. $\frac{rho}{r}$	C3. β_T^*	C4. β_G^*	C5. β_{PRI}^*
$1 > 3$	$4 > 5$	highest	lowest	unstablest

Preliminarily, why do we indicate the technology coefficients by sector, $\beta^*, \beta_G^*, \text{and } \beta_{PRI}^*$, among five consumption-neutral indicators? It does not merely mean the importance of the technology coefficient. It is because we prove one of new discoveries in a separate paper. The corresponding new discovery starts with the Phelps (1961, 1965) coefficient that holds between the rate of return and the growth rate of output at convergence. Our endogenous Phelps coefficient is shown by $x = \alpha/(i \cdot \beta^*)$. Suppose that the relative share of capital, α, is divided by the ratio of net investment to output, $i = I/Y$. The quotient is meaningful and leads to an interesting reduction. As a result, the endogenous Phelps coefficient reduces to $1/\beta^*$. And, the technology coefficient becomes politically much useful when it is measured by sector, $\beta^*, \beta_G^*, \text{and } \beta_{PRI}^*$.

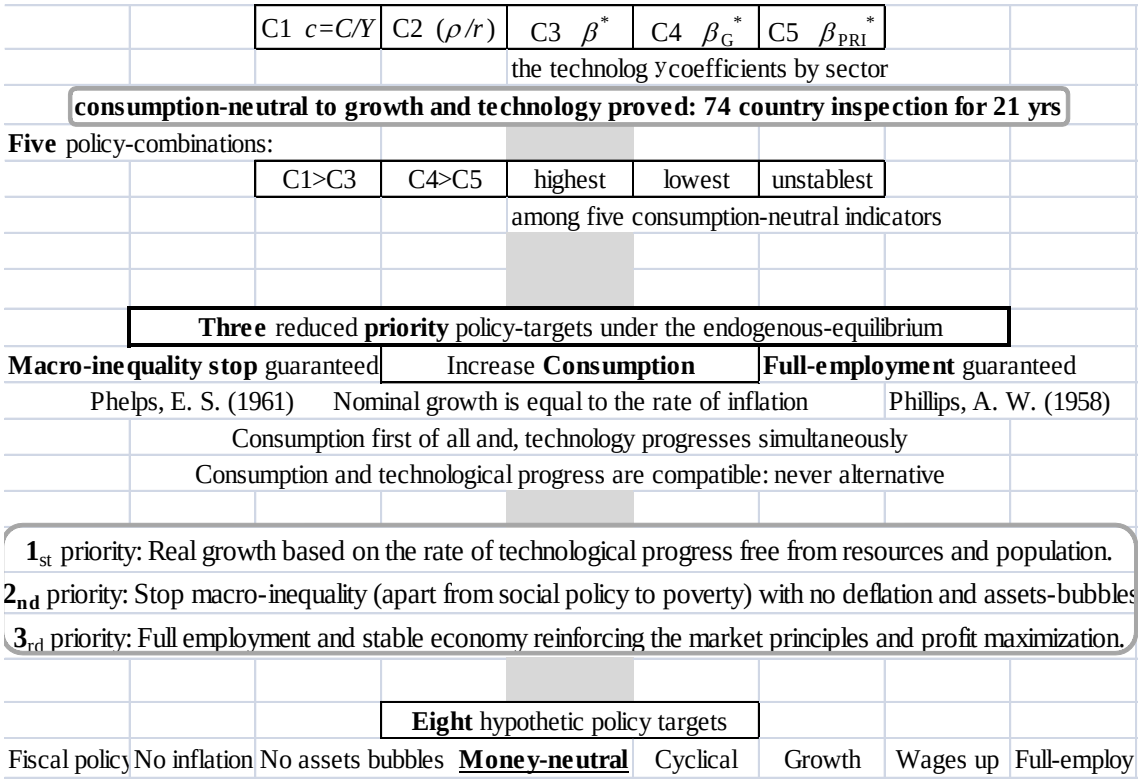

Figure 1 Policy empirics-method by country: using 74 countries, 1990-2010

Five policy combinations (i.e., from C1. to C5.) were established after hundreds of experiments based on KEWT database by country. Five policy-combinations present final evaluation as a whole. Each number (the following C1. C2. C3. C4. C5.) of five policy combinations is a base for the final evaluation. Each number reinforces the whole evaluation and serves for policy-makers' priority by year and over years.

Table 1 Test results of preferences and technology by country for 74 countries, 1990-2010/11

	1 > 3	4 > 5	highest	lowest	unstablest		1 > 3	4 > 5	highest	lowest	unstablest
1. the US	+	+	2	4	once, 5	E1. Austria	+	+	2	5	0
2. Canada	+	+	2	3	4	E2. Belgiun	+	−	2	4	slightly, 5
3. Australia	+	−	2	4	4	E3. Finland	+	+	2	5	once, 4
4. New Zea	+	−	2	4	5	E4. France	enough, +	close to 0	2	almost, 4	slightly, 4
5. Mexico	+	+	2	5	0	E5. Germar	enough, +	−	2	4	0
6.Banglade	+	+	2	5	5	E6. Greece	unstably, +	close to 0	too much, 2	4	3 and 5
7. China	−	−	2	1	1	E7. Ireland	−	−	settling, 2	4	once, 2, 4, 5
8. India	+	+	2	5	almost, 0	E8. Italy	fully, +	−	2	4	3, 4, 5
9. Indonesi	+	+	2	5	0	E9. Luxemb	close to 0	fully, −	2	4	once, 4
10. Japan	+	+	2	5	4	E10. Nethe	+	almost 0	2	3, 4, 5	0
11. Korea	always, 0	−	2	4	4	E11. Portug	enough, +	−	2	4	slightly, 5
12. Malays	−	0	2	1	0	E12. Sloval	+	+	2	3, 5	once, 3, 5
13. Philippi	+	+	2	5	slightly, 5	E13. Slover	close to 0	−	2	4	0
14. Singapo	−	−	2	1	0	E14. Spain	+	robustly, −	2	4	0
15. Sri Lan	+	+	2	5	0	South Afric	+	0	2	4	0
16. Thailan	−	slightly, +	2	1	0	Israel	+	−	2	4	2, 4
17. Vietnar	close to 0, +	fully, +	2	5	close to 0	aver. of EU	+	+	2	5	0
18. Taiwan	close to 0, +	close to 1, −	2	4	0	aver. of A&	close to 0, +	unstable	2	3	5
	1 > 3	4 > 5	highest	lowest	unstablest		1 > 3	4 > 5	highest	lowest	unstablest
aver. of Eur	fully, +	fully, +	2	5	once, 4, 5	1.Argentina	close to 0, +	0	2	3, 5	0
1.Denmark	enough, +	close to 0	2	4	once, 5	2. Bolivia	+	0	2	3, 5	once, 3, 4, 5
2. Iceland	enough, +	close to 1	2	4	slightly, 4	3. Brazil	−	0	2	3, 5	once 2, 3, 5
3. Norway	close to 0, +	fully, −	2	4	a little bit, 4	4. Chile	+	+	2	5	a little bit, 5
4. Sweden	enough, +	close to 0, +	2	5	slightly, 5	5. Colombi	+	close to 0, +	2	3, 5	often, 4
5. Switzerla	close to 0, +	0	2	3, 5	0	6. Paraguay	+	0	2	3, 5	slightly, 4
6. the U K	stably, +	close to 0, +	2	5	once, 4	7. Peru	fully, +	close to 0, +	2	3, 5	a little bit, 4
1. Bulgaria	widely, +	closer, −	2	4	0	8. Iran	more, −	0	2	1	a little bit, 4
2. Czech R	close to 0, +	closer, +	2	4	0	9. Kazakhs	close to 0, +	0	2	3, 5	once, 2
3. Hungary	fully, +	stably, +	2	5	once, 5	10. Kuwait	unstably, −	unstably, −	2	1	1, 2, 3, 4, 5
4. Latvia	closer to, +	almost, 0	2	5	once, 5	11. Pakista	widely, +	0	2	3, 5	slightly, 2
5. Poland	stably, +	close, −	2	4	once, 4	12. Saudi A	close, −	0	2	1	1
6. Romania	widely, +	closer, −	2	4	0	13. Algeria	widely, +	0	2	1	once, 4
7. Russia	widely, +	changing, +,	2	4	once, 4, 5	14. Egypt	widely, +	a little bit, +	2	3, 5	a little bit, 4
8. Turkey	widely, +	widely, +	2	5	5	15. Kenya	widely, +	0	2	3, 5	3, 5
9. Ukraine	widely, +	widely, +	2	5	adjusting, 5	16. Moroc	widely, +	0	2	3, 5	once, 3, 5
Estonia	closer to, +	stably, −	2	4	almost, 0	Ethiopia	unstably, +	unstably, −	2	5	2, 3, 4, 5
Lithuania	+	−	2	4	once, 5	Nigeria	+	unstably, +	2	3, 5	1, 2
Honduras	+	0	2	3, 5	0	Tanzania	+	0	2	3, 5	almost, 0

Data source: KEWT databases 6.12, 1990-2010 and 7.13, 1990-2011. Original data are from *International Financial Statistics yearbook*, IMF; ten from the real assets and 15 from the financial/ market assets and externalities.

C1. C1. > C3.:

$c = C/Y > \beta^*$. It means that the propensity to consume is higher than the technology coefficient. If $C1. > C3.$ exists, prior national policy target is to increase consumption as a country. If $C1. < C3.$ exists, prior national policy target is to improve technological progress as a country. If $C1. \fallingdotseq C3.$ exists, policy-makers must decide which to take as a priority in the long-run as a base. $C1. \fallingdotseq C3.$ indicates that a delicate balance between preferences and technological progress holds. Leaders often

select an easier alternative for the future of the country. Leaders target must be long-run oriented instead of short-run oriented.

C2. C4. $>$ C5.:

$\beta_G^* > \beta_{PRI}^*$. Here note that the private sector reflects the total (T) economy as a result of weighted average of aggregation so that β_T^* does not appear at C2. $\beta_G^* > \beta_{PRI}^*$ means that at technological progress the government (G) sector is inferior to the private (PRI) sector. This relationship is overwhelmingly involved in the future version of a country. Leaders and policy-makers first will decide which to take, government leadership or enterprise leadership. Also this relationship reflects the current results of the policies accumulated in the past. Attention: Causes and effects/results are simultaneously expressed by year and over years in the endogenous system. If $\beta_G^* > \beta_{PRI}^*$ exists, government think that it is natural due to the character of government. But, this notion is risky and dangerous since some countries have realized that the G sector is superior to the PRI sector at technological progress. If $\beta_G^* < \beta_{PRI}^*$ exists, government is superior to enterprises at technological progress or, enterprises' animal spirit is weak and just expect more subsidies from its government. People of the country must accept miserable results, apart from oral services and vote excuse. If $\beta_G^* = \beta_{PRI}^*$ exists, policy makers need to perceive the same result at $c = C/Y > \beta^*$ above. Dynamic balances by year are a target but, often incidental rather than efforts.[6]

C3. 'Highest' among five consumption-neutral indicators:

For technological progress of $\beta^*, \beta_G^*, \text{and } \beta_{PRI}^*$, the lower the better, particularly under a moderate range of the endogenous-equilibrium. For another technological progress of $1-\beta^*, 1-\beta_G^*, \text{and } 1-\beta_{PRI}^*$, the higher the better. Due to $1 = \beta^* + (1-\beta^*)$, $\beta^* \text{ and } (1-\beta^*)$ have the same implication and no difference. C3. reduces to C1., for $c = C/Y > \beta^*$ and; C2., for $\beta_G^* > \beta_{PRI}^*$.

C4. 'Lowest' among five consumption-neutral indicators:

Which is better, higher or lower? In the shorter-run, interpretation and evaluation for 'lowest' differs by country, depending on five consumption-neutral indicators and five policy combinations. In the longer-run, of course, the target is C2., for comparing $\beta_G^* \text{ with } \beta_{PRI}^*$.

[6] $\beta_G^* > \beta_{PRI}^*$ is an answer to 'The crisis of capitalist democracy' by Richard A. Posner (2010) in 'The crisis of macroeconomics.' The endogenous system always holds at any country regardless of capitalism or socialism, and democracy or autocracy and, under the market principles or non-market principles such that several Arabian countries take. Endogenous results definitely reflect qualitative level of leaders and policy-makers (for ultimate answer, see chapter for Axioms).

C5. Most far from stability ('unstable' shown in Figure 1):

This is directly shown by the speed years for convergence yet, the speed years do not extend quality differences spread among five consumption-neutral indicators. C5. focuses on the worst of five consumption-neutral indicators combined. It is difficult to have each country's policy combinations interpreted fairly among countries. C5. often occurs when leaders and policy makers stand at between short and long-run. Nevertheless, any country faces at C5. when deficits and debts expand beyond a certain level over GDP or over national disposable net income, $Y=C+S=W+\Pi$. The risk of default is the first priority for people always. However, default is better than hyper-inflation and money tightness. As investigated by Carmen M. Reinhart and Kenneth S. Rogoff (2009, 2011), almost all the countries have experienced default historically for the last 800 years.[7]

6. Test results by country and policy empirics-method Found commonly to countries

The Fifth shows a highlight of this chapter. Policy empirics-method to inspect relationships between preferences and technological progress are now settled. Repeating, any country is able to enjoy economic stability by specifying preferences by country and simultaneously improving the rate of technological progress. Up to date, economists advocate various refreshed strategies, perceiving severe facts and, so as not to repeat (a) failures inefficiently or negatively taken by government assistances and (b) failures of investment and subsidiaries to enterprises. Nevertheless, economists recognize (c) a defect that strategies are not connected with basic real assets policies and (d) a defect that basic real assets polices are unknown under the market principles. The endogenous system has to accept the defect of (c) similarly to the market principles. Yet, the endogenous system finds a unique method to avoid the defect of (d), as stated at several chapters of the *EES* (ibid.).

Table 2 shows test results by country using policy empirics-method found commonly to countries and clarifies three policy-priorities in policy empirics-method. Let us sum up the final stage of policy empirics-method common to all the countries in this world. What is the 1st, 2nd, and 3rd priority of economic policies?

[7] Reinhart , C. M. and Rogoff , K. S. (249-273, ibid., 2009) rises the BCDI Index (under the title of Developing a Composite Index of Crisis), based on five definitions of chapter 1; external and domestic sovereign default, banking crises, currency crashes, and inflation outbursts. It may be interesting for readers to compare 'the BCDI Index' with 'five policy-combinations,' as discussed in this chapter.

Table 2 Test results and three policy-priorities in policy empirics-method found commonly to countries using 74 countries by area, 1990-2010/11

1>3 and **4>5** by area	Numbers of countries	1>3 (+)	1<3 (−)	0: 1≒3 (x)	Numbers of countries	4>5 (+)	4<5 (−)	0: 4≒5 (x)	including
Pacific & Asia area	18	14	4	0	0	0	0	0	
EU area	18	14	1	3	0	0	0	0	
Europe (excl. EU) area	19	16	0	3	18	6	6	6	irregular: 2
Rest (incl. Africa) area	19	13	4	2	19	3	2	14	unstably: 3
Total	74	57	9	8	37	9	8	20	

lowest' among 5 ratios (see Note 1)	Numbers of countries	1 c=C/Y	2 rho/r	3 beta*(T)	4 beta*(G)	5 beta*(PRI)	3, 5 together	3, 4, 5 together	Numbers of countries
18 Pacific & Asia area	18	4	0	1	5	8			18
14 EU area +2+2	18	0	0	1	12	3	1	1	18
6+9 Europe area +3+1	19	0	0	0	10	7		2	19
7 S. America & 12 Rest	19	4	0	0	0	2		13	19
Total	74	8	0	2	27	20	1	16	74

Note 1: Five ratios are numbered as follows: 1. c=C/Y 2. rho/r 3. beta*(T) 4. beta*(G) 5. beta*(PRI)

Note 2: '**highest**' among five ratios always falls into 3. rho/r. It implies that the first priority to economic stability is 'raise consumption.'

How unstable by ratio	Numbers of countries	1 c=C/Y	2 rho/r	3 beta*(T)	4 beta*(G)	5 beta*(PRI)	Sub-numbers of countries	8 specific cases#	Numbers of countries
18 Pacific & Asia area	18	1	0	0	4	4	9	9	18
14 EU area +2+2	18	0	0	0	3	3	6	12	18
6+9 Europe area +3+1	19	0	0	0	4	7	11	8	19
7 S. America & 12 Rest	19	1	2	0	6	1	10	9	19
Total	74	2	2	0	17	15	36	38	74

8 specific cases# are: 1,2; 2,4; 3,5; 4,5; 2,3,5; 3,4,5; 2,3,4,5; 1,2,4,3,4,5. Case 4,5 two countries and others only one country.

8 specific cases implies: The higher the numbers of 8 specific cases the more artificial the economic polcies become, apart from free priority.

Note: Data source and Note in Table 1 is applied to Table 2 and related Figures 4 to 9 (abbreviated here).

The **1st policy-priority** in policy empirics-method among 74 countries:

For relationships between preferences and technological progress, the priority is the propensity to consume without exception. This priority is accurately and expectedly proved by 74 countries, 1990-2010/11 (including 9 experimental-period countries, mainly in African area, partly due to given immature statistics data). First of all, when consumption increases, economic stability is guaranteed.

The **2nd policy-priority** in policy empirics-method among 74 countries:

Each of the countries respectively has its own peculiar policy combinations. It is surprising that among countries we cannot find a common policy-setting by year and over

years. We feel that unbelievable efforts executed by policy-makers by year and over years. This is a bright fact for the future. Why bright? Leaders and policy-makers usually belong to some interest groups to get votes and popularity in the short run. This is indispensable. Nevertheless, through severe competitions in the global economies, policy-makers intuitively know justice and righteousness through the market principles in the long run. In the long run, the differences between actual statistics data and endogenous data are narrowed and most steadily rewarded by country. This indicates that spiritual level moves towards true life-time satisfaction, from money-oriented to human-oriented motives. Some may be afraid: Does total demand decrease by country unstably? No. Decreases in some goods/products are replaced by more expensive one, which increases *GDP* steadily. People may say that new industry must be brought up. Here remain some obstacles if people do not know policy empirics-method for evaluating preferences and technological progress.

The **3rd policy-priority** in policy empirics-method among 74 countries:

The more free policy-making the more robust and stable the economy is. Some countries, as seen in Table 2, do not enjoy stable economy. Why? It is similar to 'bonsai' or artificial combinations of various policies supported by no strong pole among policies. In this respect, I consent to Friedrich Hayek's (1960) background. Planning may be all right at some periods. After planning periods, what target policy-makers could take with enough confidence? Tables 4 and 5 propose endogenous vivid answers.

7. Conclusions

This chapter is thoroughly policy-oriented from technological progress viewpoint, i) independent of national taste, preferences, and culture, ii) based on the *EES* under endogenous equilibrium, and iii) reinforcing statistics data under the market principles. The *EES* is robustly policy-oriented while statistics steadily record-oriented by nature and, both systems are supplemental and united by using the KEWT database and its recursive programming by year.

This chapter, based on one of nature-aspects, distinguishes several definitions to understand the whole picture of endogenous and actual data and compares each other, endogenously, externally, and exogenously under assumptions. These definitions are a) policy empirics-method, b) five consumption-neutral indicators, c) five policy-combinations, d) three policy-priorities in policy empirics-method. Besides, the *EES* uses seven endogenous parameters that determine all the parameters and variables simultaneously and also six 'organic' aspects in Notations. Further, a whole system never make enemies and accept different aspects and ideas, and methods. Therefore, from researchers' learning viewpoint, the literature and all the economists are willing to accept

eight (hypothetic) policy targets.[8]

This chapter presents an empirical analysis and synthesis based on policy empirics-method, to evaluate and test relationships between preferences and technological progress by country, sector, year and over years, using KEWT database, 1960/90 to 2010/11, whose original data come from *International Financial Statistics Yearbook*, IMF. Policy empirics-method activates three policy-priorities in policy empirics-method.

Policy-makers are able to further stabilize actual and endogenous results by stepping into plan-do-see policies with eight policy targets. Theory: six 'organic' aspects, five nature-aspects, and eight policy targets correspond with each other. Policy practice: five policy-combinations and three policy-priorities march together in the policy empirics-method established in this chapter. This chapter is unique in revealing a fact that five policy-combinations and three policy-priorities solve policy problems in reality, by controlling seven endogenous parameters and five policy-combinations.

[8] Eight policy targets are: (1) Full-employment and a low inflation, (2) Money-neutral of the financial/market assets to the real assets, (3) Full-employment independent of inflation or deflation, (4) *CPI* (consumer price index) independent of assets bubbles, (5) Deflation independent of financial/market assets policies, (6) Fiscal policies independent of financial/market assets policies, (7) Stop macro-inequality and robust national disposable net income per capita, independent of financial/market assets policies, and (8) Maximum rate of return with minimum net investment to national disposable net income.

References

1. Blinder, Alan, S., and Solow, Robert, M. (1973). Does Fiscal Policy Matter? *Journal of Public Economics* 2 (Nov, 4): 319-337.
2. Harrod, R. F. (1939). An Essay in Dynamic Theory, *The Economic Journal*: 49 (March): 14-33.
3. Hayek, Friedrich. (1960). *The Constitutions of Liberty*. The University of Chicago. 576p.
4. Hicks J. R. (1932). *The Theory of Wages*. London, Macmillan. 248p., (2nd ed.; 1963, 384p.).
5. Kamiryo, Hideyuki. (1974). *A comparison of Financial Objectives and Behavior in Japanese and American Firms*. Master of Science in Management, Sloan School of Management, MIT. 426p. (nominated for the Brooks Prize Award).
6. Kamiryo, Hideyuki. (1984). *The Integrated Method to Measuring Profitability and Productivity with Special References to the Comparison of Agriculture and Manufacturing Within and Between Countries*. PhD in agricultural economics, Lincoln College, Univ. of Canterbury, nz. 461p.
7. Kamiryo, Hideyuki. (1995). *The Structural Theory of Flows, Assets, Debt, and Equity in Accounting for Business Enterprises*. PhD in commercial science, Hiroshima Shudo University. 558p. (with additional supplement, 1989, 393p.).
8. Kamiryo, Hideyuki. (2003). *Furthering the Role of Corporate Finance in Economic Growth.* PhD in economics, the University of Auckland, nz. 129p.
9. Kamiryo, Hideyuki. (2014). The United-Measure System between Macro and Micro: the Prices-Parabolas, Concave, Convex, versus the Amounts-Hyperbolas. *Review of Income and Wealth* (Jan 10, 2014, received),20p.
10. Lucas Robert, E. (1976). Economic Policy Evaluation: A Critique,19-46. In: Brunner Karl, and Allan H., Meltzer, *The Phillips Curve and Labor Market*. Amsterdam: North-Holland.
11. Posner, Richard, A. (2010). *The Crisis of Capitalist Democracy*. Harvard University Press. 402p.
12. Reinhart, C. M., and Rogoff, Kenneth, S. (2009). *This Time is Different: Eight Centuries of Financial Folly*. Princeton, NJ: Princeton University Press. xiv+463p.
13. Reinhart, Carmen M. and Rogoff, Kenneth S. (2011). The Forgotten History of Domestic Debt. *The Economic Journal* 121 (May): 319-350.
14. Samuelson, P. A. (1970). Law of the Conservation of the Capital-output ratio, Proceedings of the National Academy of Sciences, *Applied Mathematical Science* 67: 1477-79.
15. Solow, Robert, M. (1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics* 70 (Feb, 1): 65-94. (For four corrections, see the same page 94 below: In Ed., Stiglitz, Joseph, E., and Uzawa, Hirofumi, (1969). *Readings in the Modern Theory of Economic Growth*, Cambridge. Mass: MIT, viii, 497p.).
16. Solow, R. M. (1957). Technical Change and the Aggregate Production Function. *Review of Economic Studies* 34 (Aug, 3): 312-320.
17. International Monetary Fund (IMF). *International Financial Statistics Yearbook*, by year, IMF. http://imf.org ; World Bank: http://data.worldbank.org .
18. UN: http://unstats.un.org/unsd/snaama/selectionbasicFact.asp .