Slipping the Clutch of Happiness

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What is value and how is it measured? Vast increases in measured wealth over the last century have not translated to commensurate increases in happiness. Is this ongoing failure indicative of fundamental errors the perception and measurement of value? How do such errors affect wealth-creation choices and the happiness outcomes of those choices? In exploring these ideas, this paper postulates, that: 1) Value can be either -- intrinsic in nature (i.e. of value in itself), or instrumental in nature (i.e. of value for what it can produce), 2) Instrumental value is easier to measure and is often more tangible than intrinsic value, 3)Accountants, economists, and managers are predisposed by history, philosophy, training, and temperament to focus on instrumental value while ignoring much that is of intrinsic value, 4) Much of the wealth generation over the past century has focused on instrumental wealth, and 5) The growing imbalance (favouring instrumental over intrinsic wealth) is a growing drag on happiness. This paper examines the outcomes of a postulated situation where the technology producing intrinsic value is fixed while that yielding instrumental value improves by orders of magnitude (i.e. factors of 10).

INTRODUCTION

A number of researchers (Clarke, 1963, pp.141-162; McHale, 1971, pp.301-339; Simon, 1981; Moore, 1995; Kurzweil, 2001; DeLong, 2004; Wright, et al., 2004) show that world incomes are growing wonderfully richer. However, world happiness is not tracking the growth of world income—Frank (1999) asserts that:

> "Study after careful study shows that, beyond some point, the average happiness within a country is almost completely unaffected by increases in its average income level … average satisfaction levels register virtually no change even when average incomes grow many-fold."

This paper postulates that slippage between rising happiness and rising wealth may be an artefact of the economic specification of income and wealth. Specifically, economists and accountants value wealth in terms of *value-in-trade* and income as either the *net change in* *wealth before consumption* or the *sum of consumption and net savings* (Pass et al., 1991, p.541; Hicks, 1946, pp.171-181; Staubus, 1977, p.235)

From its inception, the discipline of (classical, modern, and neo-classical) economics consistently argued against mercantilism (i.e. against gold/money having intrinsic value), argued that gold/money has only instrumental value (i.e. as a means of acquiring consumables) and associated utility with consumption:

☑ Adam Smith (1812, p.334) argued the "…real wealth or poverty of the country would depend altogether upon the abundance or scarcity of …consumables."

☑ Hicks (1946, pp.171-181) defined income "as the maximum which can be consumed by a person in a defined period without impairing his welloffness as it existed at the beginning of the period".

The concept of intrinsic value is well received by philosophers (Quinton, 1973, pp.351-380) but not by economists or accountants—whose practical reliance on market values (value-in-trade) for valuation has deflected their attention to instrumental values and away from the esoteric and difficult to measure intrinsic value. This paper examines a postulated situation where value is expressed as intrinsic and instrumental variants, the annual bequest of time must be allocated between the production of each value variant, and each value variant is necessary but insufficient to produce utility (i.e. happiness or wellbeing).

THE WORLD IS GETTING WEALTHIER

Whether or not the world is getting wealthier is an empirical issue. Figure 1 provides empirical support for Clarke's (1963), Simon's (1981), and Moore's (1995) conclusions that world wealth is increasing.

Figure 1: World Per Capita GDP, Adjusted for the Value of New Goods & Services (adapted from DeLong's 2004 data set)

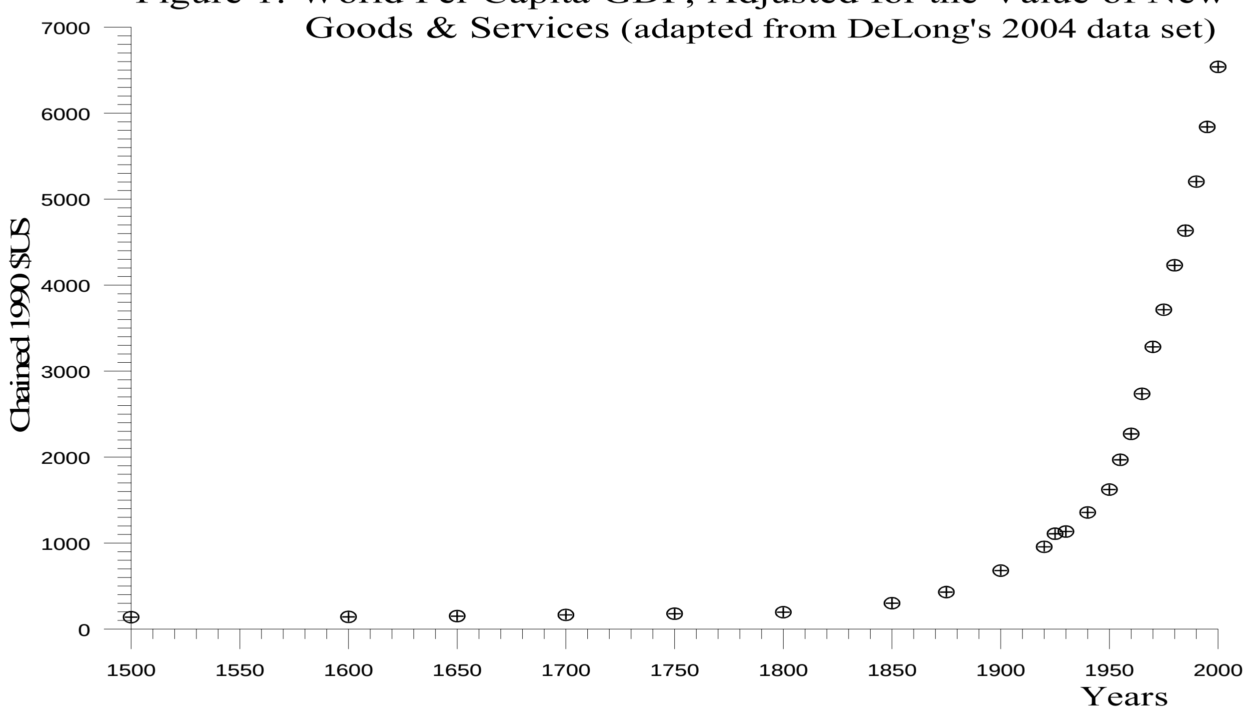


Figure 2: Annual Growth Rates for World Per Capita GDP for 1650-2000 CE
(adjusted for rising service potental and 1925 removed as an outlier)

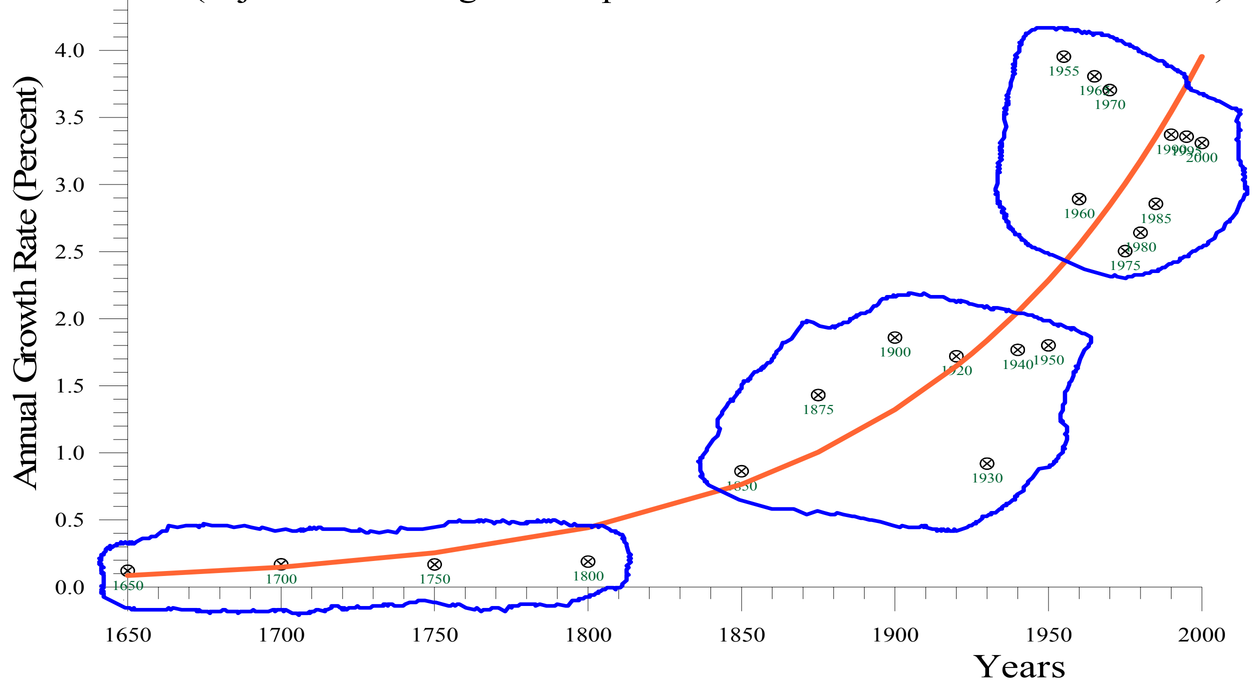


Figure 2 clearly shows that the annual growth rate for world per capita GDP (WPCGDP) was less than one -half of one percent before 1800, was 1 to 2 percent from 1850 to 1950, and was 2.5 to 4 percent from 1960 to 2000. Thus, WPCGDP growth is more than exponential—it is double exponential growth (i.e. the rate of growth is, itself, rising exponentially).

While it is quite fashionable to observe that no exponential process continues indefinitely, there is (at this time) no evidence or reason to believe that the exponential *jerk* (i.e. acceleration of acceleration) in the WPCGDP is likely to stop or to even slow at any time in the foreseeable future. Specifically, WPCGDP is growing because of accelerating technical know-how (i.e. applied knowledge) and the precursor to that process (i.e. pure knowledge) is growing ever faster and the lead-times to development and application are falling (Kurzweil, 2001). In a simile—as long as the fuel flow continues accelerating, it is (*ceteris paribus*) madness to forecast that the fire it feeds will stop or even slow.

Figure 3 (adapted, Wright, et al., 2004) and Table 1 show an unequivocal trend to accelerating riches—the first 10-fold increase in WPCGDP took over 400 years (1500 to 1900), the second took less than 100 years (1900 to 2000), the third will take less than 40 years (2000 to 2040), the fourth will take less than 30 years (2040 to 2069), and the fifth will take less than 23 years (2069 to 2092). The WPCGDP in 2092 will be 100,000 times greater (i.e. 10^5) than it was at the start of the process (in 1500).

Figure 3: World Per Capita GDP Indexed to 2000 CE
(the Raw Data Points are Superimposed)

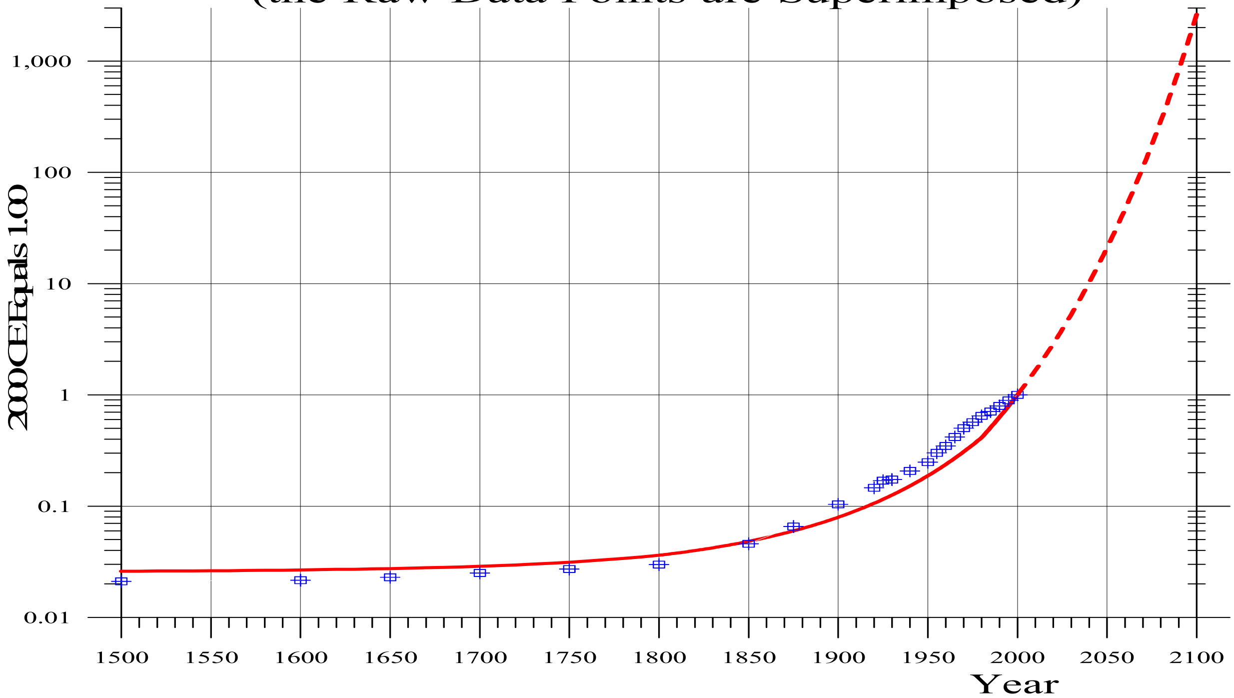


Table 1: World Per Capita GDP Indexed to 2000 CE, for Selected Years

		1800	1900	1950	2000	2014	2040	2069	2092	2100
Est.	**WPCGDP**	**0.036**	**0.080**	**0.188**	**1.00**	**2.06**	**10.2**	**101.5**	**1,033**	**2,626**
Obs.	WPCGDP	0.030	0.104	0.248	1.00	na	na	na	na	na

Having shown that people have become richer and are becoming richer at an accelerating rate, the focus of this paper shifts to explaining why these rising riches fail to create commensurate rises in happiness. While Wright et al. (2004) postulate a plethora of potential causes for this slippage, this paper focuses on a single theme—that intrinsic and instrumental values differ in ways that are important to the generation of utility.

SPECIFICATION OF A MODEL OF THE VALUES AND UTILITY

Utility is assumed to be a function of intrinsic and instrumental values, that function is assumed to take a traditional Cobb-Douglas form (Silverberg, 1978, pp.84-90), and everyone is assumed to have the same utility function of:

$$U = Q^a W^b \tag{1}$$

U = utility (wellbeing or happiness)
Q = intrinsic Value
W = instrumental Wealth
a,b = taste parameters/variables

In order to focus solely on *the effect of intrinsic and instrumental value on utility*, this model assumes away complications like money, savings, inventories, and capital investment—leaving time as the only production input.[1] Given these assumptions, allocating the annual time bequest of 1 year (8,766 hours) between the production of intrinsic value and instrumental value is the decision variable that controls the output of utility. All of the bequest time is assumed to be allocated to production of either intrinsic value or instrumental value—thus, the time-allocation variables are locked into a time allocation constraint:

$$1.00 \equiv q + h \tag{2}$$

q = percent of time to producing intrinsic value
h = percent of time to producing instrumental value

While assuming constant returns to scale in eqn (1) is not essential, it is a common assumption (Silverberg, 1978, pp.84-90), it makes verification of the model mathematics easier, and (as will be shown later) it allows some terms in the model to cancel against one another—making manipulation of the model easier. Thus, for mathematical convenience, scale effects in the model is assumed to be constrained so that:

$$a + b = 1.00 \tag{3}$$

The production functions are assumed to be linear and of the form:

$$Q = q\Omega \tag{4}$$

Q = quantity of intrinsic value produced
Ω = technology parameter for Q

$$W = h\Psi \tag{5}$$

W = quantity of instrumental value produced
Ψ = technology parameter for W

The budget line is created reorganizing eqn (2) to define "h", substituting the LHS of that result into eqn (5) and setting "q" equal first to 0.00 and then to 1.00 in eqn (6):

$$(Q,W) = (q\Omega,\ h\Psi) = [q\Omega,\ (1-q)\Psi] \tag{6}$$

$$= [(1-h)\ \Omega,\ h\Psi] \tag{6a}$$

The Y-axis intercept and the x-axis intercept are, respectively, "Ω" and "Ψ".
The indifference curve is defined by reorganizing eqn (1) to:

$$Q = (UW^{-b})^{(1/a)} \tag{1a}$$

The general shape of eqns (6) and (1a) are displayed in Figures 4 and 5.

[1] Applied time is the quintessential input—all other inputs can be thought of as intermediary stages (e.g. work-in-progress) between the application of time and the completion of the finished good.

GENERAL ANALYSIS OF THE MODEL

The maximization of this model can be specified with four variables (q, h, a, and b) and five equations—a maximization equation, an input limit, a scale limit, and two production equations

MAXIMIZE: $U = Q^a W^b$ (1)
Subject to: $1 \equiv q + h$ (2)
$1 = a + b$ (3)
$Q = q\Omega$ (4)
$W = h\Psi$ (5)

When eqn (2) is reorganized to define "h" and the RHS (right-hand side) of the reorganized eqn (2) is substituted into eqn (5) and the RHS of that result plus the RHS of eqn (4) are substituted into eqn (1) the result is:

$$U = (q\Omega)^a[(1-q)\Psi]^b \quad (7)$$

When eqn (7) is differentiated with respect to "q" the result is:

$$\delta U/\delta q = aq^{(a-1)}\Omega^a(1-q)^b\Psi - b(q\Omega)^a(1-q)^{(b-1)}\Psi^b \quad (8)$$

When eqn (8) is set equal to nil it can be simplified to:

$$q^* = 1/(b/a +1) \quad (9)$$

q* = optimum time to producing intrinsic value

A similar process shows that:

$$h^* = 1/(a/b + 1) \quad (10)$$

h* = Optimum time to producing instrumental value

The optimum outputs of intrinsic value and instrumental value are defined by substituting the RHS of eqns (9) and (10) into eqns (4) and (5) to give:

$$Q^* = \Omega/(b/a +1) \quad (11)$$
$$W^* = \Psi/(a/b +1) \quad (12)$$

The optimum utility is defined by substituting the RHS of eqns (11) and (12) into eqn (1):

$$U^* = [\Omega/(b/a +1)]^a[\Psi/(a/b +1)]^b \quad (13)$$

In the special case of constant economies of scale (e.g. a + b = 1):

$$q^* = a = (1-b) \quad (9a)$$
$$h^* = b = (1-a) \quad (10a)$$
$$Q^* = a\Omega = (1-b)\Omega \quad (11a)$$
$$W^* = b\Psi = (1-a)\Psi \quad (12a)$$
$$U^* = a^a\Omega^a\Psi^{(1-a)}(1-a)^{(1-a)} \quad (13a)$$

$$U^* = \Omega(1\text{-}b)^{(1\text{-}b)})\Psi^b b^b \qquad (13b)$$

EFFECT OF ASYMETRIC INCREASES TO "Ψ"

This model provides general answers to the question what happens if "Ω" (the technology producing intrinsic value) is fixed and "Ψ" (the technology producing instrumental value) improves by orders of magnitude (i.e. by factors of 10).

1) The allocation of time to produce each value type is independent of the technology parameters (Ω and Ψ). As a result, changes in technology will not affect how people allocate their time between producing intrinsic and instrumental value. Specifically, because the technology parameters (Ω and Ψ) are not in eqns (2), (9), and (10):

$$q^* = (1\text{-}h^*) = f(a,b) \qquad (14)$$
$$h^* = (1\text{-}q^*) = f(a,b) \qquad (14b)$$

2) The optimal intrinsic-value output is independent of the instrumental-value technology-parameter (Ψ) but is affected by changes to the time allocation parameters (a and b). Specifically, if eqns (11) and (11a) are differentiated with respect to "Ψ", "a", and "b" the results are:

$$\delta Q^*/\delta\Psi = \text{-0-} \qquad (15)$$
$$\delta Q^*/\delta a = \Omega > \text{-0-} \qquad (16)$$
$$\delta Q^*/\delta b = \text{-}\Omega < \text{-0-} \qquad (17)$$

3) The optimal output of instrumental value varies, as a constant, with changes to the instrumental-value technology-parameter (Ψ) and is affected by changes to the time allocation parameters (a and b). Specifically, if eqns (12) and (12a) are differentiated with respect to "Ψ", "a", and "b" the results are:

$$\delta W^*/\delta\Psi = 1/(\ a/b + 1) > \text{-0-} \qquad (18)$$
$$\delta W^{*2}/\delta^2\Psi = \text{-0-} \qquad (19)$$
$$\delta W^*/\delta a = \text{-}\Psi < \text{-0-} \qquad (20)$$
$$\delta W^*/\delta b = \Psi > \text{-0-} \qquad (21)$$

4) The optimal utility varies with changes to "Ψ" at a declining rate (e.g. optimal utility as a function of "Ψ" is convex to the origin) —when eqn (13) is differentiated with respect to "Ψ" the result is:

$$\delta U^*/\delta\Psi = b\Psi^{(b\text{-}1)}(\ a/b + 1)^b[\Omega/(\ b/a + 1)]^a > \text{-0-} \qquad (22)$$
$$\delta U^{*2}/\delta^2\Psi = b(b\text{-}1)\Psi^{(b\text{-}21)}(\ a/b + 1)^b[\Omega/(\ b/a + 1)]^a < \text{-0-} \qquad (23)$$

If the returns to scale are constant (i.e. a + b = 1.0) or declining (i.e. a + b < 1.0), then (b-1) will be negative and eqn (23) will be negative—this is also true for the range of increasing returns to scale (i.e. a + b > 1.00), but only when b < 1.00.

5) Utility can be changed, *ceteris paribus*, by changing tastes (i.e. changing parameters “a” and “b”).

When eqn (2) [a+b = 1.00] holds and $\Omega = \Psi = 1.00$, then eqn (1) [$U = Q^aW^b$] is at a:

- Minimum when tastes are perfectly balanced (i.e. a = 0.50 and b = 0.50). Specifically, per eqn (13a), $U^* = 0.50^{2(0.50)} = a^a\Omega^a\Psi^{(1-a)}(1-a)^{(1-a)} = 0.50$, and
- Maximum as tastes approach a perfect imbalance (e.g. as either a or b approaches 1.0). Specifically, per eqn (13a), U* = 1 when Ω=1, Ψ=1, and either a→1 or b→1.

What this implies is that when Ω and Ψ are roughly equal, a movement in tastes away from moderation toward either an ascetic (high a-value; low b-value) or a *Bon Vivant* (high b-value; low a-value). As Ψ increases to orders of magnitude

—if eqns (13a) and (13b) are differentiated with respect to the taste parameters, the results are:

$$\delta U^*/\delta a = b\Psi^b[b\Omega/(a+b)]^a[a/(a+b)]^b/(a+b)(1/a - \mathit{ln}[b\Omega/(a+b)]b/(a+b)) \qquad (24)$$
$$\delta U^*/\delta b = a\Psi^a[a\Psi/(a+b)]^b[b/(a+b)]^b/(a+b)(1/b - \mathit{ln}[a\Psi/(a+b)]a/(a+b)) \qquad (25)$$

Equation (24) is equal to nil when:

$$\Omega = e^{(1/a + 1/b)}/(a/b + 1) \qquad (26)$$

Equation (25) is equal to nil when:

$$\Psi = e^{(1/a + 1/b)}/(b/a + 1) \qquad (27)$$

6) When returns to scale are constant (i.e. a + b = 1.0), the utility increase produced by increasing “a” (i.e. decreasing “b”) declines with subsequent increases to “a” (i.e. decreases to “b”).

A NUMERICAL ANALYSIS OF THE MODEL

The following numerical analysis uses eqns (6) and (13a) or (13b) and assumes:

- Initially that “a” and “b” (taste parameters) are 0.60, and 0.40, respectively, but later change to 0.40 and 0.60, respectively.
- Initially, that the production parameter “Ω” is fixed at 1.00 while the other (“Ψ”) varies from 1.00 to 10, to 100 to 1,000.
- A contrast situation where both production parameters (Ω and Ψ) are increased from 1 to 10, to 100 to 1,000.

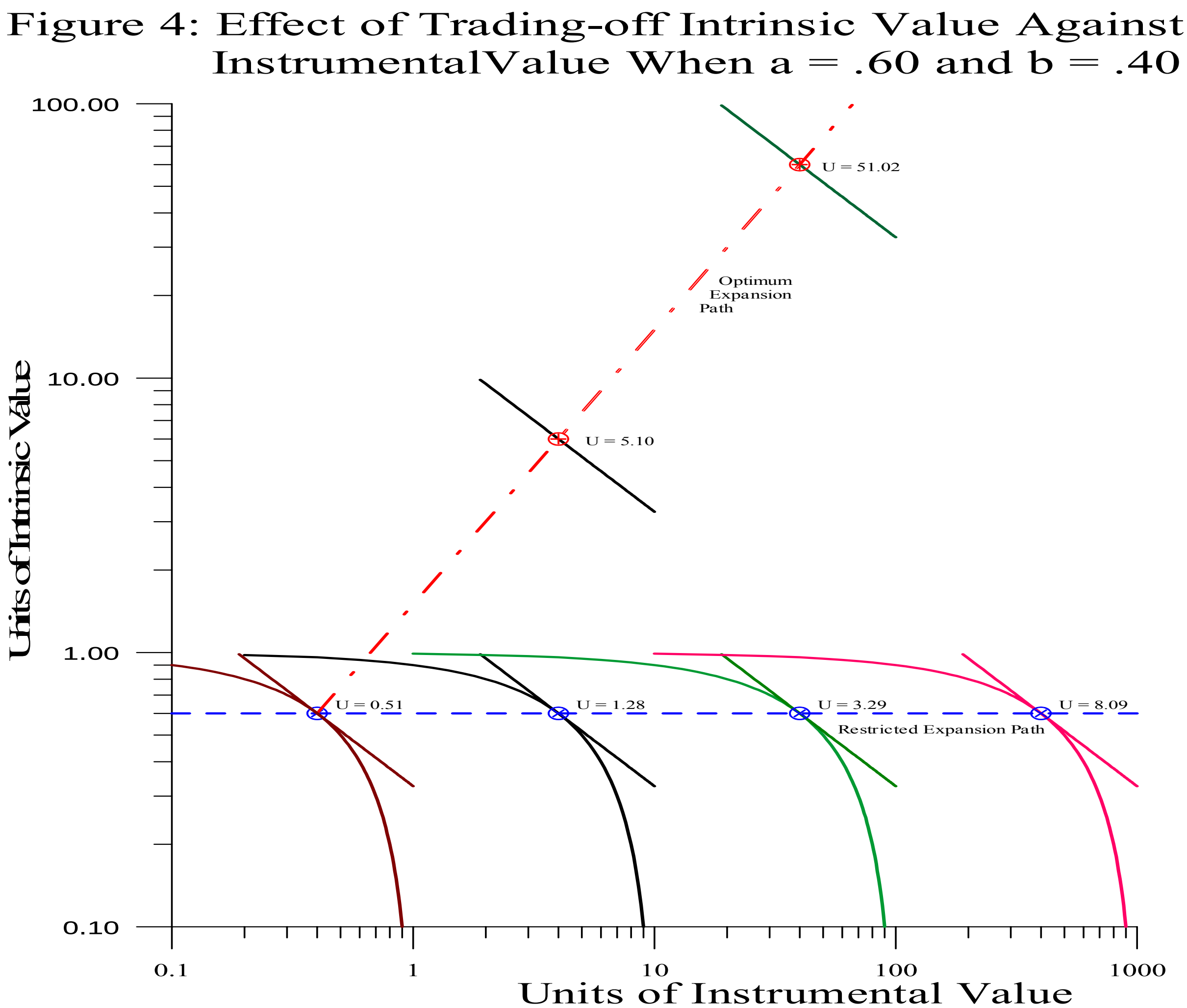
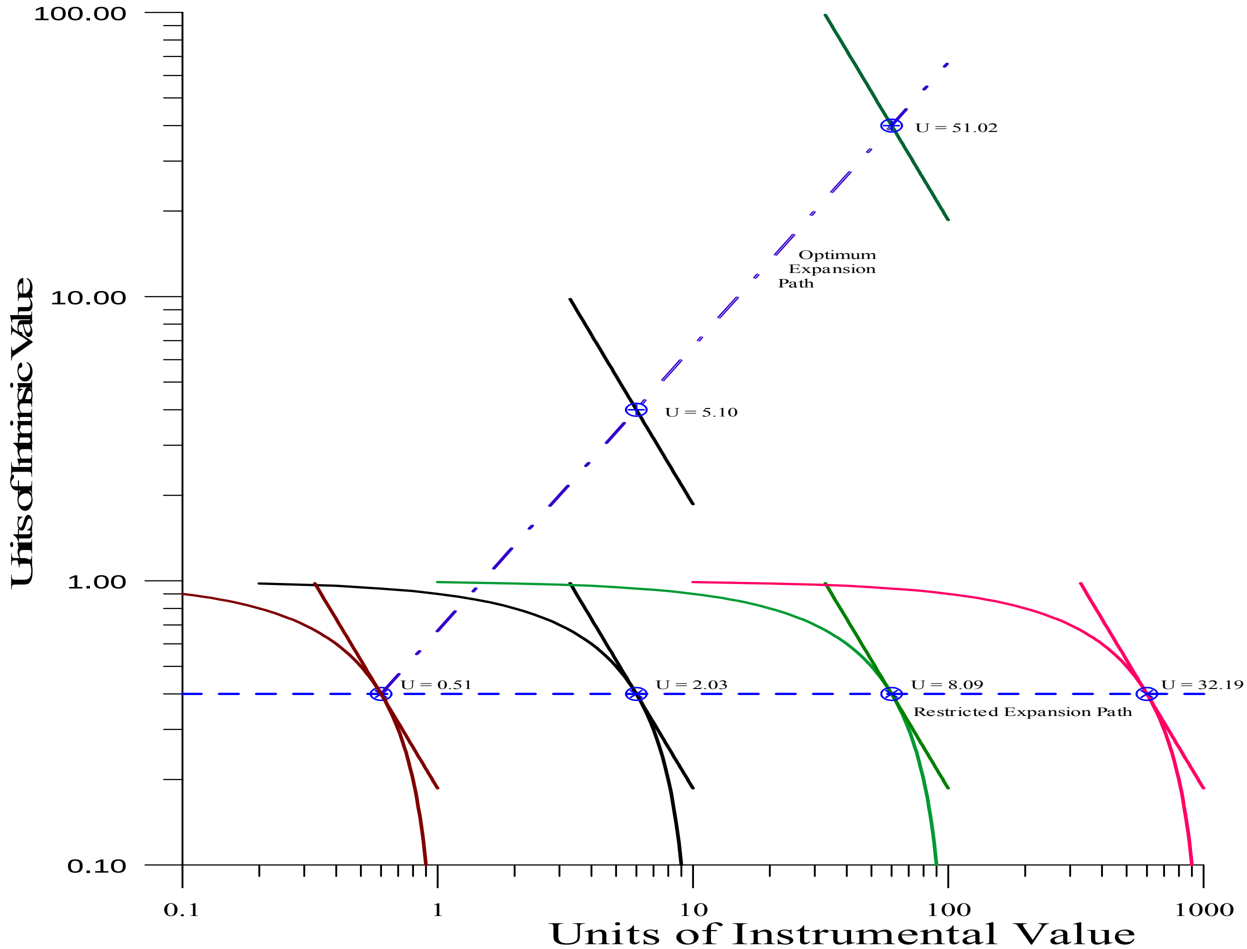


Figure 4, shows the model output for taste parameters "a" and "b" of, respectively, 0.60 and 0.40.The dashed line parallel to the X-axis is the expansion path when the production parameter "Ω" is restricted to 1.00 and the rising dash-and-dot line is the optimum expansion path—where both of the output parameters ("Ω", "Ψ", and utility) all expand at the same rate.

Typically, in models of this type, the Budget Lines are linear and the Indifference curves are curved convex to the origin. However, in Figures 4 and 5, the X-axis is displayed in Log-10 format—the resulting shortening of the X-axis causes an illusion that the budget lines are curved concave to the origin and an illusion that the Indifference curves are linear. The Log-10 format is used on the X-axis in Figures 4 and 5 to provide reasonable detail in a reasonable amount of space.

Figure 5: Effect of Trading-off Intrinsic Value Against InstrumentalValue When a = .40 and b = .60



The contrast between Figures 4 and 5 illustrates the effect of changing tastes where taste-parameters “a” and “b” shift from 0.60 to 0.40 and 0.40 to 0.60, respectively.

In the situations displayed by Figures 4 and 5, if the production parameter for intrinsic value is fixed or sticky when there is an increase in production parameter for instrumental value, the result is major slippage between the increase in instrumental wealth and the increase in utility. Making the best of a bad situation is still a bad situation.

This slippage effect can be estimated by the following equation:

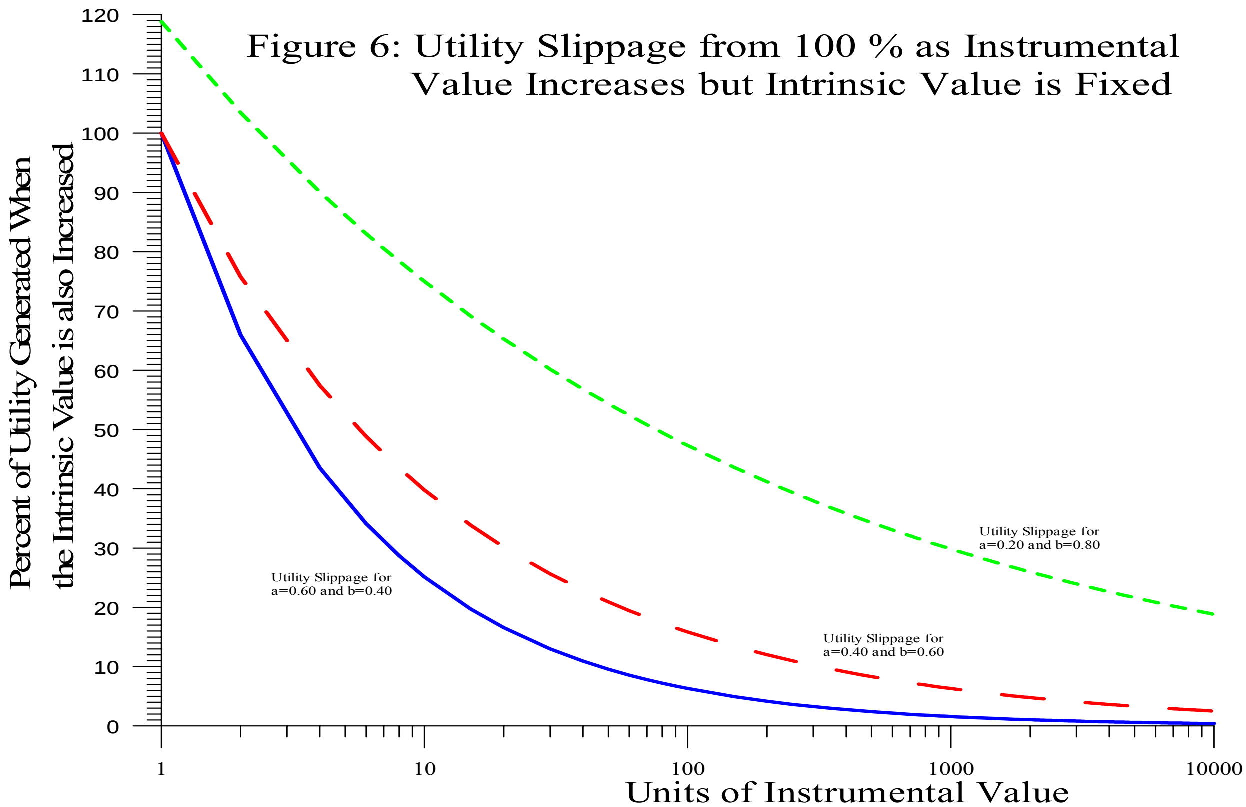
$$U_1/U_0 = (\Psi_1\Psi_0)^b + (\Omega_1\Omega_0)^a = (W_1W_0)^b + (Q_1Q_0)^a \qquad (28)$$

In the Figures 4 and 5 situations, when $\Psi_1\Psi_0 = 10$, eqn (26) becomes, respectively:

$$U_1/U_0 = 10^{0.40} + 0.00^{0.60} = 2.51 \qquad (26a)$$
$$U_1/U_0 = 10^{0.60} + 0.00^{0.40} = 3.98 \qquad (26b)$$

The results in eqn (26a) and (26b) can be expressed as a *traction* ratio by changing the equations to:

$$0.10(U_1/U_0) = (10^{0.40} + 0.00^{0.60})/10 = 0.251 \quad (26c)$$
$$0.10(U_1/U_0) = (10^{0.60} + 0.00^{0.40})/10 = 0.398 \quad (26d)$$



The slippage indicated by eqns (26c) and (26d) from a single 10-fold increase in Instrumental income is substantial at 74.9and 60.2 % for the situations in, respectively, Figures 4 and 5—NB: a 100-fold increase squares the traction values in the above equations (0.063 and 0.158 for eqns (26c) and (26d), respectively) and a 1,000-fold increase cubes the values (0.016 and 0.063 for eqns (26c) and (26d), respectively).

The slippage can be reduced (and, as a result, utility increased) by increasing the relative desirability of the instrumental value. For example, in the Figure 5 situation the increase in the "b" taste parameter from 0.40 to 0.60 (and resulting decrease in "a" from 0.60 to 0.40) reduced the slippage by nearly 20 % (1 - 0.602/0.749) and increased the utility by nearly 59 % (0.398/0.251 - 1)—for a 1000-fold increase, the shift in "b" reduced slippage by nearly 5 % [(0.063 - 0.016)/(1 - 0.016)] and increased utility by nearly 294 % (0.063/0.016 – 1).
A change in tastes that increases parameter "a" increases utility by shifting the optimum away from the origin along the X-axis, but that taste shift effect on utility is offset, to a degree, because it also shifts the optimum toward the origin along the Y-axis. The optimum expansion path (produces the highest utility) is along a ray with the rise-over-run of "a" vs. "b". However, the utility loss from being unable to balance the increases in the increases in intrinsic and instrumental values are, in Figure 5, still 60.2%, 84.2% and, 93.7% for (respectively) a 10-fold, a 100-fold, and a 1000-fold increase in annual instrumental value.

HICKSIAN SHADOW VALUES

A means is needed to measure how the value-in-trade of each of the production parameters changes as "Ψ" increases and "Ω" is held constant.
If eqn (13a) is differentiated with respect to each of the production parameters, then:

$$\delta U^*/\delta\Omega = a(a^a\Omega^{(a-1)}\Psi^{(1-a)}(1-a)^{(1-a)}) \quad > -0- \qquad (29)$$
$$\delta U^*/\delta\Psi = (1-a)(a^a\Omega^{(a-1)}\Psi^{(-a)}(1-a)^{(1-a)}) \quad > -0- \qquad (30)$$

A measure of the utility-production value of an additional unit of "Ω" or "Ψ" is provided, respectively, by eqns (29) and (30) Thus, eqn (29) divided by eqn (30) is the value-in-trade of "Ω" in units of "Ψ"—given that this value contrasts the relative increase required in each production parameter to raise utility by one unit, an appropriate name for the measure would be The Hicksian Shadow Value (HSV).

$$HSV(\Omega) = (\delta U^*/d\Omega)/(dU^*/d\Psi) = (\delta U^*/\delta\Omega) \text{ x } (\delta\Psi/\delta U^*) = \Psi/[(1/a - 1)\Omega] \quad (31)$$
$$HSV(\Psi) = (\delta U^*/\delta\Psi)/(\delta U^*/\delta\Omega) = (\delta U^*/\delta\Psi) \text{ x } (\delta\Omega/\delta U^*) = (1/a - 1)\Omega/\Psi \quad (32)$$

It is clear from eqn (31) that, when the parameters "Ω" and "a" are fixed, the HSV of "Ω" increases proportionally with increases to the parameter "Ψ". Thus, if "Ψ" increases 1,000-fold when "Ω" and "a" are fixed, people will gladly exchange an opportunity to add 1,000 units of "Ψ" for one added unit of "Ω"—given the other assumptions in this analysis (constant economies of scale, complete allocation of time, no stockpiling, etc.) this means that, given the above situation, people will gladly exchange 1,000 units of instrumental value for 1 unit of intrinsic value.

COMMENTARY ON THE ANALYSIS

Given the assumptions and specification of the Value and Utility Model, if the production technology of intrinsic value is fixed and the production technology of instrumental value is increased by orders of magnitude, then:

1) The allocation of the annual bequest of time (8,766 hours/year), between producing intrinsic and instrumental value, remains constant unless the taste parameters (a and/or b) change.
2) The output of intrinsic value remains constant as long as parameters Ω, a, and b do not change.
3) The output of instrumental value will increase proportionally with changes to parameter "Ψ".
4) Utility will increase with increases to parameter "Ψ", but at a decreasing rate—implying a diminishing marginal utility of income (or money). If intrinsic value can either be bought or otherwise produced using instrumental value then, given a constant-returns-to-scale utility function, consumers should be able to allocate between intrinsic and instrumental value such that the marginal utility of income is constant.
5) Changing tastes can change utility—this can be thought of as the sour-grapes or making the best- of-a-bad-thing solution.

6) If the production technology of intrinsic value is fixed or sticky, then the Hicksian-shadow value of intrinsic value should rise as incomes rise. Very large increases to income should generate very large increases in the Hicksian-shadow value of intrinsic value.

CONCLUSIONS

Expanding instrumental value (material wealth) and limited intrinsic value open a path of least resistance to a materialistic society. However, even small increases in the ability to increase intrinsic value open up immense opportunities to enhance well-being by orders-of-magnitude (i.e. by factors of ten). Future research is needed on the nature of value, its measurement, and its balanced creation. The future will clearly be fabulously richer—whether it is wonderfully happier depends on the investment choices made by this generation.

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