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The Spirit of Capitalism and Long-run Growth

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In the long run, cultural attributes and the spirit of capitalism help explain why Japan, the four Asian “miracles,” and many countries with Protestant religion have succeeded economically.

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This paper is a product of the Public Economics Division, Country Economics Department. It is part of a larger effort in PRE to study long-run growth and economic policies. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Ann Bhalla, room N10-055, extension 37699 (28 pages).

Why do different countries have different long-term savings and growth rates? Why is the productivity rate not the same around the world? Recent new theories of endogenous growth have tried to answer these questions by replacing the usual assumption of diminishing returns in production. Zou offers an alternative: he introduces "the spirit of capitalism" (as Max Weber used the term) into the model.

In the long run, countries with different degrees of capitalist spirit will have different consumption, capital stock, and endogenous growth rates. In Zou's model (unlike traditional models), inflation is no longer superneutral in relation to long-run growth.

Zou provides a formal model that is supported by many empirical and historical studies on cultural attributes and economic development. His model helps explain:

- Why Japan and the four Asian "miracles" have succeeded.
- Why nations that had an established Protestant religion in 1870 had a per capita income in 1979 that was more than a third higher than in Catholic nations.
- Why British industry has declined since 1850.

"The Spirit of Capitalism" and Long-Run Growth

By

Heng-fu Zou

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"The Spirit of Capitalism" and Long-Run Growth

I. Introduction

Traditional optimal growth models such as Phelps (1961), Cass (1965) and Koopmans (1965) have demonstrated that, with typical neoclassical production function and exogenously given time discount factor, the maximization of an additive utility function defined on per capita consumption by a representative agent or family leads to a unique steady state where the net marginal productivity of capital equals the time discount rate. If two countries have the same technology and the same discount rate, it is expected that per capita consumption, per capita capital stock, saving rate and returns on capital are all equalized in steady state.

This well-known convergence theorem of economic growth has been faced with a growing number of challenges in recent years. Empirically, the convergence theorem cannot explain several puzzling economic facts: (i) why the growth rates in some developing countries with Confucian culture, like four East Asian 'miracles' of South Korea, Taiwan, Hong Kong and Singapore are so high and the rates in some developing countries so low; (ii) why the relative income gap between developed countries and developing countries is getting wider rather than narrowing; (iii) why productivity levels have not converged; and (iv) why the nations with Protestant religious establishment in 1870 had 1979 per capita income more than one-third higher than the nations with Catholic religion (DeLong, 1987). To try to answer these problems, some

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new theories have emerged. A typical starting point for these new theories is to depart from the usual assumption of diminishing returns (Romer, 1986, and Lucas, 1988). Romer (1986) has shown that, under increasing returns to scale, the level of per capita income in different countries need not converge.

We believe that culture differences among countries, in addition to technology, play an important role in the determination of economic growth. Here our alternative growth model is based on Max Weber's theory of "the spirit of capitalism" and a mathematical model of Mordecai Kurz (1968). In an unduly neglected paper of the economics profession, Kurz (1968) deviates from the conventional wisdom of economics and defines utility function on both consumption and capital which he calls wealth effects. As we will see in Section II, this novel definition of preference function reflects the essence of the spirit of capitalism: the continual accumulation of wealth for its own sake, rather than for the material rewards that it can serve to bring. (We hasten to add that Kurz's original model is a purely technical one and he does not offer any explanation or justification for his inclusion of capital into the preference. We hope that our reasoning will not distort Kurz's original ideas.)

As a result of the presence of so-called wealth effects in the preference function, the steady state capital stock is larger than the modified golden rule level, and the forms of utility functions play a crucial role in determining equilibrium consumption and capital. Therefore, countries with the same technology and the same time discount rate may have different steady state depending on the difference in their wealth effects or their capitalist spirit.

In recent contributions to endogenous growth theory, the technology is often assumed to be constant or increasing returns in capital input. To

generate growth, for all levels of capital stock, the net marginal product of capital is further assumed to be bounded below by the time discount rate. In Sections III and IV, we will demonstrate how the capitalist spirit can cause endogenous growth even though the net marginal product of capital can be smaller than the time discount rate or can go to zero as capital increases without bound. Through a specific example, it is shown that the stronger the capitalist spirit, the higher the endogenous growth rate and the saving rate.

In Section V, we extend the model to a monetary economy. In a hybrid Sidrauski-Kurz model, we find that there exist multiple balanced growth paths and inflation can increase the balanced growth rates.

Section VI discusses the empirical relevance of the capitalist spirit. By citing work of sociologists, historians and economists, we will see that the capitalist spirit approach to economic growth and development has been widely used in many historical and empirical studies.

We conclude this paper in Section VII with a few remarks.

II. "The Spirit of Capitalism" and Its Mathematical Representation

Here we first present a model essentially the same as in Kurz (8). A representative agent maximizes a discounted utility over an infinite time horizon subject to a dynamic constraint of capital accumulation:

$$\text{Max } \int_0^{\infty} [u(c) + v(k)] e^{-\rho t} dt \quad (1)$$

s. t.

$$\dot{k} = f(k) - c \quad (2)$$

where c is consumption, k is capital stock, and ρ is the time discount rate and $0 < \rho < 1$. $f(k)$ is the net output function (= gross output - capital depreciation). A dot over a variable denotes time derivative. The utility function has the following standard properties:

$$u'(c) > 0, u''(c) < 0, u'(0) \rightarrow \infty \text{ and } u'(\infty) \rightarrow 0;$$

$$v'(k) > 0, v''(k) < 0, v'(\infty) \rightarrow 0;$$

The net output function $f(k)$ is typically neoclassical:

$$f(0) = 0, f'(k) > 0, f''(k) < 0, f'(0) \rightarrow \infty, f'(\infty) \rightarrow 0, f(\infty) \rightarrow \infty.$$

so $f(k)$ is strictly concave; and when capital stock increases without bound, the net marginal product of capital goes to zero and the net output increases to infinity.

The optimal path of capital accumulation is described by the following two dynamic equations:

$$-u''(c)\dot{c} = v'(k) + u'(c)(f'(k) - \rho) \quad (3)$$

$$\dot{k} = f(k) - c \quad (2)$$

Let the steady state values be denoted as k^* and c^* , then

$$v'(k^*) + u'(c^*)(f'(k^*) - \rho) = 0 \quad (4)$$

$$f(k^*) - c^* = 0 \quad (5)$$

Two facts immediately follow from these two equations. First, the steady state capital stock is higher than modified golden rule level. To see this, we compare the steady state condition (4) to the modified golden rule in Cass (1965),

$$f'(k^*) = \rho - \frac{v'(k^*)}{u'(c^*)} < \rho = f'(k^{\text{mg}})$$

where k^{mg} denotes the modified golden rule capital. Since $f''(k) < 0$, $v'(k)$ and $u'(c)$ are positive for all k and c , $k^* > k^{\text{mg}}$. Second, the steady state capital is no longer independent of the preference functions as in the Cass model. In fact, even if different countries have the same time discount rate and technology, the difference in the utility functions can give rise to different per capita capital stock and per capita consumption across countries in the long run.

In the rest of this section, we are going to argue why the inclusion of capital or wealth into the preference reflects "the spirit of capitalism" in Max Weber's sense and how some great economists in history have developed the same idea in their growth theories.

In "*The Protestant Ethic and the Spirit of Capitalism*", Max Weber (1958) defines capitalism as the rational organization of formally free labour (p.21). The essence of the spirit of capitalism is the continual accumulation of wealth for its own sake, rather than only for the material rewards that it can serve to bring (p.4).

"At all periods of history, wherever it was possible, there has been ruthless acquisition, bound to no ethical norms whatever". But only in a capitalist economy, "man is dominated by the making of money, by acquisition as the ultimate purpose of his life. *Economic acquisition is no longer subordinated to man as the means for the satisfaction of his material needs.* This reversal of what we should call the natural relationship, so irrational from a naive point of view, is evidently a *leading principle of capitalism* as it is foreign to all people not under capitalist influence" (p.53, italic added.).

Weber's idea is clear: capital accumulation in a capitalist economy is motivated not only by the maximization of the long-run consumption, but also by the enjoyment (utility) from enhancing wealth itself. This capitalist spirit approach to long-run growth has been also taken by Adam Smith (1937), Karl Marx (1977) and John Maynard Keynes (1971), among many others.

In the "*Wealth of Nations*", Adam Smith (1937) makes the following description of a capitalist society's saving behavior:

"The principle which prompts to save, is the desire of bettering our condition, a desire which though generally calm and dispassionate, comes with us from the womb, and never leaves us till we go into the

grave. . . . An augmentation of fortune is the means by which the greater part of men propose and wish to better their condition. It is the means of the most vulgar and the most obvious; and the most likely way of augmenting their fortune, is to save and accumulate some part of what they acquire, either regularly and annually, or upon some extraordinary occasions. Though the principle of expence, therefore, prevails in almost all men upon some occasions, and in some men upon almost all occasions, yet in the greater part of men, taking the whole course of their life at an average, the principle of frugality seems not only to predominate, but to predominate very greatly." (*The Wealth of Nations*, pp.324-25)

Adam Smith is so occupied by the moral of savings, he declares that "every prodigal appears to be a public enemy, and every frugal man a public benefactor." (P.324)

Karl Marx (1977) also shares this view with many so-called classical economists. He regards the instinctive nature of accumulation by capitalists as an essential part of capitalism:

"Accumulate, accumulate! That is Moses and the prophets! 'Industry furnishes the material which saving accumulates!' Therefore save, save, i.e., reconvert the greatest possible portion of surplus-value into capital! Accumulation for the sake of accumulation, production for the sake of production: this is the formula in which classical economists expressed the historical mission of the bourgeoisie in the period of its domination." (*Capital*, Vol.1, p.742)

John Maynard Keynes (1971) develops the same idea in his statement of the "psychology" of capitalist society¹. He says that

¹ I thank Jeffrey Sachs for directing my attention to Keynes' work "*The Economic consequences of the Peace*".

"Europe was so organised socially and economically as to secure the maximum accumulation of capital. While there was some continuous improvement in the daily conditions of life of the mass of the population, society was so framed as to throw a great part of the increased income into the control of the *class least likely to consume it*. The new rich of the nineteenth century were not brought up to large expenditures, and *preferred the power which investment gave them to the pleasures of immediate consumption...* Herein lay, in fact, the main justification of the capitalist system. If the rich had spent their new wealth on their own enjoyments, the world would long ago have found such a regime intolerable. But like bees they saved and accumulated, not less to the advantage of the whole community because they themselves held narrow ends in prospect." (*The Economic Consequences of the Peace*, p.11, italic added)

Keynes continues to describe the saving behavior of the capitalist class:

They "were allowed to call the best part of the cake theirs and were theoretically free to consume it, on the tacit underlying condition that they consumed very little of it in practice. *The duty of 'saving' became nine-tenths of virtue and the growth of the cake the object of true religion.* ... And so the cake increased; but to what end was not clearly contemplated. Individuals would be exhorted not so much to abstain as to defer, and to cultivate the pleasures of security and anticipation. Saving was for old age or for your children; but this was only in theory --- the virtue of the cake was that it was never to be consumed, neither by you nor by your children after you" (P.12, italic added).

Therefore, defining utility on both consumption and capital is a way to model the nature of capitalism mathematically. In this respect, for space limitation, we add only one more excellent quotation from Gustav Cassel(1924):

"There is a formation of capital for which it is hardly possible to assign any concern about the future as motive. It cannot be said of the leading capitalists who satisfy all their wants of any consequence, and have a capital the returns on which guarantees this satisfaction of wants for all time to them and their families, yet constantly set aside large sum to increase their wealth, that they save out of the concern about the future. In these cases there must be some other motive. It is the economic interest of the capitalist to increase his wealth, and this in time becomes an end in itself. The motives that are at work are numerous. The senseless cupidity that in times finds its sole pleasure in contemplating the growth of its wealth, and may very well be described as an abnormal sluggishness of spirit and a pathological impoverishment of the emotional life, is certainly not the sole explanation. The desire of splendor and of the higher position in the society which the possession of great wealth assures, the stimulation of jealousy of other men, the healthy joy of the strong man in successful work as such, in ruling large masses, in influence especially --- these are all factors that have to be taken into account." (*The theory of Social Economy*, pp.228-29.)

To define utility function on both consumption and capital or wealth is also a way to model man not only as an economic animal, but also a political animal. Ever since Aristotle, we are taught that "man is by nature an animal of intended to live in a polis". (see Aristotle, 1958). Wealth or property provides man not only consumption means but also political power and social

prestige. Possession of wealth is, to a considerable degree, a measure and standard of a person's success in a society. Thus capital and wealth directly enter to the utility function of the representative agent of the capitalist economy. In a recent book on power, Galbraith (1984), following the long tradition of sociology and political science, classifies wealth as one of three resources of political power. "In past time, so great was the prestige of property that ... it accorded power to its possessor. What the man of wealth said or believed attracted the belief of others as a matter of course." (p49) To this day, "wealth per se no longer gives automatic access to conditional power. The rich man who now seeks such influence hires a public relations firm to win others to his beliefs. Or he contributes to a politician or a political action committee that reflects his views. Or he goes into politics himself and uses his property not to purchase votes but to persuade voters." (p. 50)

This analysis agrees with what Lord Acton's (1988) contention that: "Power goes with property" (P. 572). In a *laissez-faire* capitalist economy, "freedom of accumulation not only carries with it the possibility of cumulative increase in the inequality of economic power, ... in addition, economic power confers power in other forms, including the political." (Frank Knight, 1942, P. 82). Seeking high social position and power has been long recognized as one of the most important motivation in capital accumulation. In the discussion related to the spirit of capitalism, Max Weber (1958) explicitly states that "the desire for the power and recognition which the mere fact of wealth brings plays its part" (P. 70) in capital accumulation.

So much is the justifications why we should define a representative agent's utility function on both consumption and capital (or wealth). We turn next to the relation between the capitalist spirit and endogenous growth.

III. "The Spirit of Capitalism" and Endogenous Growth

Recent contributions to endogenous growth theory have shown that long-run growth rate can be endogenously determined by preference and technology. A common starting point of many models is to assume that the production technology has increasing or constant returns to scale instead of diminishing returns: e.g., Romer (1986), Lucas (1988), Barro (1990) and Rebelo (1991). In a convex model of endogenous growth, while allowing decreasing returns to scale, Jones and Manuelli (1990) assume that the net marginal product of capital does not go to zero as the stock of capital increases without bound. In fact, in all these models, in order to generate endogenous growth, it is required that the net marginal product of capital is always greater than the time discount rate. This is the so-called lower boundary condition on technology.

We are going to show that the inclusion of the capitalist spirit into the model can generate endogenous growth without this lower boundary condition. In this section we will retain all the assumptions regarding the utility functions in the last section. In the following, unless otherwise noted, the net production function is strictly concave and, when capital stock increases to infinity, the net output also increases to infinity, but the net marginal product of capital can be less than the time discount rate, ρ :

$$f''(k) < 0, \text{ and } f(\infty) \rightarrow \infty, \text{ and } f'(\infty) < \rho.$$

From the last section, the optimal conditions regarding the time path of consumption and capital accumulation can also be written as:

$$\dot{c} = \{v'(k)/u'(c) + [f'(k) - \rho]\sigma(c)\}^{-1} \quad (6)$$

$$\dot{k} = i(k) - c \quad (2)$$

where $\sigma(c)$ is the coefficient of the absolute risk aversion:

$$\sigma(c) = -u''(c)/u'(c).$$

It is immediate from (6) that, if there is no capitalist spirit and $v(k)$ and $v'(k)$ are zero, we go back to the standard Cass model: in the long run, as the net marginal product of capital is less than the time discount rate, ρ , consumption growth will stop when the net marginal product equals the time discount rate, i.e., $f'(k) = \rho$. All the new endogenous growth models have tried to "escape" from this rule by modifying the technology such that the net marginal product of capital is always larger than the time discount rate (the lower boundary condition). With this lower boundary condition, capital and consumption will grow for ever.

Due to the existence of capitalist spirit in our model, the lower boundary condition is not necessary for unbounded growth of capital and consumption:

Proposition 1: Suppose that $f'(k) + v'(k)/u'(f(k))$ is larger than the time discount rate ρ and k is any value satisfying the inequality: $f'(k) < \rho$. Then consumption and capital will rise for ever.

Proof: In equation (6), if $f'(k) \geq \rho$, the right hand side will be positive and consumption will rise: $\dot{c} > 0$. If $f'(k) < \rho$, and suppose that there exists a steady state, then, from $\dot{k} = 0$, $f(k) = c$, and from $\dot{c} = 0$,

$$v'(k)/u'(f(k)) + [f'(k) - \rho] = 0 \quad (7)$$

But equation (7) cannot hold because by assumption, $f'(k) + v'(k)/u'(f(k)) > \rho$ for any k satisfying $f'(k) < \rho$. So \dot{c} cannot be zero. The case that \dot{c} is negative can be ruled out. This is because a negative \dot{c} can happen only if $c < f(k)$ for any value of k that is higher than modified golden rule level. In this case, $[v'(k)/u'(c)]$ is less than $[v'(k)/u'(f(k))]$ for $u'(c) > u'(f(k))$. But then, \dot{k} in (2) will be positive for $f(k) > c$ and capital will increase to infinity at the same time when consumption keep decreasing. Sooner or later, the marginal utility of consumption will be significantly higher than the

marginal utility of capital (for $v'(\infty) \rightarrow 0$) and the representative agent's utility can be raised by reversing this process. Therefore, the only optimal path is to have consumption increase for ever: $\dot{c} > 0$. But without an ever increasing capital stock, this ever growing consumption is not sustainable, so $\dot{k} > 0$ always. QED.

Proposition 1 implies that, to have unbounded growth, it is essential to require that, as both consumption and capital increase to infinity, the sum of the net marginal productivity of capital and the marginal rate of substitution between capital and consumption is larger than the time discount factor. In particular, if the marginal rate of substitution between capital and consumption, $v'(k)/u'(f(k))$, is larger than the time discount rate for all k such that $f'(k) < \rho$, consumption and capital will keep growing even though the net marginal product of capital can go to zero when capital increases without bound.

The optimal dynamic path is depicted in the following phase diagram:

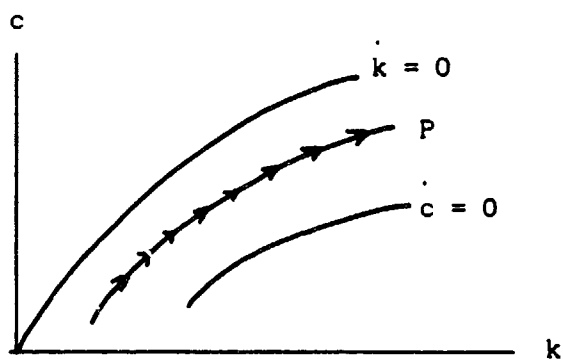


Figure 1: P is the optimal path

In figure 1, both curves are upward sloping because the slope for $\dot{k} = 0$ and $\dot{c} = 0$ are positive and are given by $[v''(k') + u'(c')f''(k')]/u''(c')[\rho - f'(k')]$ and $f'(k')$, respectively. Here c' and k' denote the values of consumption and capital satisfying the equation $\dot{c} = 0$, and c'' and k'' denote the value for $\dot{k} = 0$. Given the condition in Proposition 1, there is no intersection (i.e., no steady state) for these two curves. Since both consumption and capital are

increasing, the optimal path, P , is bounded in the region between $\dot{k} = 0$ and $\dot{c} = 0$. Below the curve $\dot{k} = 0$, c is smaller than $f(k)$ and k is positive; above the curve $\dot{c} = 0$, for given k' , c is larger than the value of consumption, c' , which satisfies that $\dot{c} = 0$, so \dot{c} will be positive as $u'(c)$ is decreasing in c , $c > c'$, and $v'(k')/u'(c)$ is larger than $v'(k')/u'(c')$.

IV. Two Examples

We first present an example by assuming that the net output is constant returns to capital as in Barro (1990) and Rebelo (1991):

$$f(k) = Ak \quad (7)$$

Just for simplicity, we let the utility functions be:

$$u(c) = \log c, \quad v(k) = \beta \log k$$

here the parameter β is positive and it measures the capitalist spirit.

To generate endogenous growth in the Barro-Rebelo model, it is essential to have the net marginal product of capital be greater than the time discount rate: $A > \rho$. This condition can be easily relaxed in our capitalist spirit model. In fact, let $A < \rho$ and so $f'(k) (= A) < \rho$. Furthermore, for $u(c) = \log c$ and $v(k) = \beta \log k$, $v'(k)/u'(f(k)) = \beta A$. If $\beta A > \rho$ though $A < \rho$, by Proposition 1, there will be endogenous growth. But since $f'(k)$ equals to A ($A > 0$) for all k , we have:

Proposition 2: Let $f(k) = Ak$ and $A < \rho$, there will be endogenous growth if $(1 + \beta)A$ is larger than the time discount rate ρ ; and the balanced growth rate, denoted as γ , is given by:

$$\gamma = A - \rho/(1 + \beta).$$

Proof: The current value Hamiltonian is:

$$H = \log c + \beta \log k + \lambda (Ak - c)$$

here λ is the costate variable. The optimal conditions are:

$$c^{-1} = \lambda \quad (8)$$

$$(\beta/k\lambda) + A - \rho = - \dot{\lambda}/\lambda \quad (9)$$

$$(A - 1/k\lambda) = \dot{k}/k \quad (10)$$

Differentiate condition (8) with respect to time and denote the constant growth rate of consumption as γ ,

$$- \dot{\lambda}/\lambda = \dot{c}/c = \gamma$$

Substitute γ into (9):

$$k\lambda = \beta/(\gamma + \rho - A) \quad (11)$$

Differentiate (11) with respect to time on both sides,

$$\dot{k}/k = - \dot{\lambda}/\lambda = \gamma$$

That is to say, the growth rate of capital on the balanced growth path is the same as the growth rate of consumption. Substitute $\dot{k}/k = \gamma$ into (10):

$$k\lambda = (A - \gamma)^{-1} \quad (12)$$

Then use (11) and (12) to solve for the balanced growth rate γ ,

$$\beta/(\gamma + \rho - A) = (A - \gamma)^{-1}$$

and

$$\gamma = A - \rho/(1 + \beta) \quad (13)$$

To have positive growth rate in (13), $A - \rho/(1 + \beta)$ needs to be positive, namely, $(1 + \beta)A > \rho$. From equation (13), the growth rate is higher if the spirit of capitalism is stronger:

$$d\gamma/d\beta = \rho/(1 + \beta)^2 > 0.$$

Even if technology and the time discount rate are the same across countries, the growth rates will be different if the capitalist spirit is different.

On the balanced growth path, the saving rate, s , is

$$s = \dot{k}/f(k) = (\dot{k}/k)(k/Ak) = \gamma/A = 1 - \rho/(1+\beta)A \quad (14)$$

So the saving rate is an increasing function of the capitalist spirit:

$$ds/d\pi = \rho/A(1+\beta)^2 > 0.$$

As a second example, we let:

$$f(k) = k^{(1-\alpha)} \quad \text{and } 0 < \alpha < 1 \quad (15)$$

so $f'(k) \rightarrow 0$ as $k \rightarrow \infty$. Let $u(c) = \log c$ and $v(k) = \beta k^\alpha$, then, if $\beta\alpha > \rho$, c and k will be positive all the time. To see this, we only need to check that the condition in Proposition 1 is satisfied:

$$v'(k)/u'(f(k)) = \beta\alpha k^{(\alpha-1)} k^{(1-\alpha)} = \beta\alpha$$

Thus there exists no steady state if $\beta\alpha > \rho$, and consumption and capital stock will keep rising.

V. Inflation and Endogenous Growth

The capitalist spirit model provides a convenient framework to study money and growth. While the general analysis of a hybrid Kurz-Sidrauski model can be done, for tractability and simplicity, we will mainly rely on some specific functions to see how inflation affects the endogenous growth rate. Again let the technology be the same as in Barro-Rebelo model:

$$f(k) = Ak.$$

With money, the wealth accumulation equation becomes:

$$\dot{a} = f(k) + x - c - \pi m = Ak + x - c - \pi m$$

$$\dot{a} = k + m.$$

where m stands for the real balances, a for wealth, x for the government transfer, and π is the expected inflation rate.

We assume that the representative agent maximizes the following discounted utility with "the spirit of capitalism" separable from the typical utility function in the Sidrauski model:

$$\max_0^{\infty} \int [u(c, m) + \beta \log a] e^{-\rho t} dt$$

To explicitly calculate the endogenous rate of growth, we let:

$$u(c, m) = \log c + \log m.$$

The optimal conditions are (λ is the costate variable):

$$\lambda = c^{-1} \quad (16)$$

$$\lambda(A + \pi) = m^{-1} \quad (17)$$

$$\beta(k+m)^{-1} + \lambda(A - \rho) = -\dot{\lambda} \quad (18)$$

$$Ak + x - c - im = \dot{k} + \dot{m} \quad (19)$$

By definition,

$$\dot{m} = (\theta - p/p)m \quad (20)$$

here θ is the money growth rate and p is the price level. On the perfect foresight path, the expected inflation rate equals the actual one:

$$\pi = \dot{p}/p \quad (21)$$

In addition, the government transfer, x , is just the revenue from inflation:

$$x = \theta m \quad (22)$$

Substituting (20), (21) and (22) into (17), (18) and (19), we obtain:

$$\lambda = c^{-1} \quad (16)$$

$$m/c = (A + \theta - \dot{m}/m)^{-1} \quad (23)$$

$$(m + k)/c = \beta(\rho - A - \dot{\lambda}/\lambda)^{-1} \quad (24)$$

$$\dot{k} = Ak - c \quad (25)$$

In the rest of this section, we focus on a particular solution to the dynamic system: the balanced growth path. Along this path, all real variables grow at a constant rate. Let γ be the growth rate of consumption, $\gamma = \dot{c}/c = \dot{\lambda}/\lambda$. Differentiate (23) on both sides with respect to time and note that \dot{m}/m is a constant:

$$\dot{m}/m = \dot{c}/c = \gamma$$

Similarly from (25),

$$\dot{k}/k = \dot{c}/c = \gamma.$$

Therefore, on the balanced growth path, consumption, real balances and capital

all growth at the same rate, γ .

Next we want to solve the balanced growth rate, γ , in terms of technology, preference parameters and money growth rate. In (23), (24) and (25), substitute all the growth rates with the common variable λ :

$$m/c = (A + \theta - \gamma)^{-1} \quad (26)$$

$$k/c = (A - \gamma)^{-1} \quad (27)$$

$$(m + k)/c = \beta[\rho - (A - \gamma)]^{-1} \quad (28)$$

As (26) plus (27) equals (28):

$$(A + \theta - \gamma)^{-1} + (A - \gamma)^{-1} = \beta[\rho - (A - \gamma)]^{-1}$$

Simple algebra leads to

$$A - \gamma = \frac{-[(\beta+1)\theta - 2\rho] \pm \sqrt{[(\beta+1)\theta - 2\rho]^2 + 4(2+\beta)\theta\rho}}{2(2 + \beta)}$$

Therefore we have two possible balanced growth rates:

$$\gamma_1 = A + \frac{[(\beta+1)\theta - 2\rho] - \sqrt{[(\beta+1)\theta - 2\rho]^2 + 4(2+\beta)\theta\rho}}{2(2 + \beta)} \quad (29)$$

$$\gamma_2 = A + \frac{[(\beta+1)\theta - 2\rho] + \sqrt{[(\beta+1)\theta - 2\rho]^2 + 4(2+\beta)\theta\rho}}{2(2 + \beta)} \quad (30)$$

In passing we note that, if the capitalist spirit is not present in the model, in other words, if $\beta = 0$, the utility function is $(\log c + \log m)$ and the unique balanced growth rate is directly given by equations (16) and (18):

$$\gamma = A - \rho$$

which is exactly the same as the case of the real economy and is independent of inflation. In this case, to guarantee positive growth, the net marginal product of capital has to be larger than the time discount rate (the lower boundary condition). By the way, we cannot set $\beta = 0$ in (29) and (30) to get the balanced growth rate because (29) and (30) are derived with the assumption

that $\beta > 0$.

In (29) and (30), we can show:

Proposition 3: The higher the inflation rate, the higher the balanced growth rates.

Proof: Differentiate γ_1 and γ_2 with respect to θ in (29) and (30):

$$\frac{d\gamma_1}{d\theta} = \frac{1}{2(2+\beta)} \left\{ (\beta+1) - \frac{[(\beta+1)\theta-2\rho](\beta+1) + 2(2+\beta)\rho}{\sqrt{[(\beta+1)\theta-2\rho]^2 + 4(2+\beta)\theta\rho}} \right\} \quad (31)$$

$$\frac{d\gamma_2}{d\theta} = \frac{1}{2(2+\beta)} \left\{ (\beta+1) + \frac{[(\beta+1)\theta-2\rho](\beta+1) + 2(2+\beta)\rho}{\sqrt{[(\beta+1)\theta-2\rho]^2 + 4(2+\beta)\theta\rho}} \right\} \quad (32)$$

In the appendix, it is shown that the right hand side of (31) is positive and $\partial\gamma_1/\partial\theta > 0$. As the right hand side of (32) is larger than the one in (31), $\partial\gamma_2/\partial\theta > 0$ as well. The possible reason for this result might be the following: with higher rate of money supply and higher inflation, the representative agent tends to substitute real balance holdings with capital. That will stimulate the rate of investment and capital accumulation, which in turn raises the balanced growth rate in the economy. In the end, as the balanced growth rate goes up, the rise in the rate of money growth does not bring about a full proportional rise in inflation rate. To see this, just look at the following identity:

$$\dot{m}/m = \theta - \pi$$

On the balanced growth paths,

$$\gamma_i = \theta - \pi, \quad i = 1 \text{ and } 2.$$

Differentiate this equation with respect to the rate of money growth:

$$\frac{d\pi}{d\theta} = 1 - \frac{d\gamma_i}{d\theta} < 1$$

Therefore, inflation falls short of the money growth rate.

Proposition 3 is a very strong result. In the Sidrauski model, it is well known that inflation does not affect long-run capital accumulation (superneutrality of money). When the purchase of both consumption and investment goods are subject to the cash-in-advance constraint, Stockman (1982) has shown a negative association between inflation and capital accumulation. Our capitalist spirit model supports the result derived from the *ad hoc* Tobin (1965) model.

Proposition 4: The stronger the capitalist spirit, the higher the balanced growth rates.

Proof: In equations (29) and (30), differentiate γ_1 and γ_2 with respect to β , and rearrange terms,

$$\frac{d\gamma_1}{d\beta} = \frac{1}{2(2+\beta)^2} \left\{ (\theta+2\rho) + \frac{\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho}}{\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho}} - \frac{(2+\beta)(\beta+1)\theta^2}{\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho}} \right\} \quad (33)$$

$$\frac{d\gamma_2}{d\beta} = \frac{1}{2(2+\beta)^2} \left\{ (\theta+2\rho) - \frac{\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho}}{\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho}} + \frac{(2+\beta)(\beta+1)\theta^2}{\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho}} \right\} \quad (34)$$

Again (33) and (34) are shown to be positive in the appendix. Thus the positive association between the spirit of capitalism and economic growth holds in both real economy and monetary economy.

VI. The Empirical Relevance of the Capitalist Spirit Model

It is interesting to observe that we economists tend to explain growth and development by dealing with capital, labor and technology, while historians, political scientists and sociologists pay much more attention to the cultural and other institutional background of growth and development. That might be the division of labor among intellectuals. Our model is an attempt to reconcile in part both stories told by economists and other social scientists.

Since Max Weber published his famous study, "*The Protestant Ethic and the Spirit of Capitalism*", there has been tremendous accumulation of literature on capitalist spirit and its relation to religions and wealth creation. Though sociologists and historians (M. Weber, W. Sombart, 1915, R. H. Tawney, 1926) often argue more about which religious belief leads to capitalist spirit, the positive link between capitalist spirit and wealth accumulation has been taken for granted. Recently there are even studies to provide theological justifications for the capitalist spirit. For interested readers, a good collection is Peter Berger's (1990) "*The Capitalist Spirit: Toward a Religious Ethic of Wealth Creation*".

Empirically, recent examples of capitalist spirit approach to growth and development are numerous. To cite a few, there are Harrison's (1985) study: *Underdevelopment is a State of Mind*, Wiener's (1981) work on the decline of British industries: *English Culture and the Decline of the Industrial Spirit: 1850 - 1980*, and MacFarquhar's (1985) study on the four Asian 'miracles' of South Korea, Taiwan, Hong Kong and Singapore: *The Post-Confucian Challenge*.

Our economics profession is not immune from this capitalist spirit approach. I quote two studies here. The first one is DeLong (1988). Contrary to the claim by William Baumol (1986), DeLong finds that the productivity levels among once-rich twenty-two countries in 1870 did not converged in 1979.

In fact, "holding constant 1870 per capita income, nation that had Protestant religious establishments in 1870 had 1979 per capita income more than one-third higher than do nations that had Catholic establishments". And he shows that "there is one striking ex-ante association between growth over 1870-1979 and an exogenous variable: a nation's dominant religious establishment. ... A religious establishment variable that is one for Protestant, one-half for mixed, and zero for Catholic nations is significantly correlated with growth as long as measurement error variance is not too high". Indeed, "it does serve as an example of how culture may be associated with substantial divergence in growth performance". DeLong is not the first economist to put forward such an argument. Kenneth Boulding (1973) entitles one of his interesting papers as "religious foundations of economic progress", in which he argues that Protestant ethic has not only influenced the development of capitalism, but "the Protestant ethic has contributed to the success of capitalist institutions, particularly in regard to their fostering a high rate of economic progress." (p. 45)

The second colorful example is Morishima (1982): *Why Has Japan 'Succeeded'?*. Under this sensational title, Michio Morishima attributes the economic success of Japan into Western technology and Japanese Confucianism. His approach is typical Weberian and his comparison between protestant ethic and Japanese etheos is illuminating. For modern capitalism to be established, a religious revolution had to come first. In the Western, "Puritanism's worldly frugality meant opposition to enjoyment and consumption, and luxury consumption especially was completely squeezed out, In this way the formation of capital was carried out through frugality; new capital was then used productively and became a new source of profit. Thus the religious revolution resulting from Protestantism created the modern entrepreneur and capitalism - a new type of person who was the possessor of an earnest faith, and who

controlled huge wealth, but nevertheless contended himself with a life of extreme simplicity, striving to accumulate capital" (pp 83 - 84).

"If the Japanese had not adopted the belief of frugality, which was another of the prerequisites of capitalism, then modern capitalism could certainly not have been achieved in Japan. In Japan in those days Buddhism and Shinto, the traditional religions, did not have that great influence on the everyday life of the Japanese people. However, ... as a result of the Tokugawa Bakufu's cultural policy, Confucianism had spread widely and deeply among the Japanese people. Confucianism was understood in Japan as an ethical system rather than a religion, and it directly taught the Japanese people that frugal behavior was noble behavior. Therefore Japan, at the end of the Meiji Revolution, had already fulfilled the second prerequisite for capitalism" (p.86).

Japan's story is not exceptional. Now South Korea, Taiwan, Singapore and Hong Kong are following the Japanese example. As observed by Roderick MacFarquhar (1985), for all these countries, "the significant coincidence is culture, the shared heritage of centuries of inculcation with Confucianism. That ideology is as important to the rise of the east Asian hyper-growth economies as the conjunction of Protestantism and the rise of capitalism in the west." "Post-Confucian economic man works hard and plays hard, buys much, but saves more".

As another example to illustrate how change in the capitalist spirit may affect industrial growth, we quote from Martin Wiener (1982): *English Culture and the Decline of the Industrial Spirit, 1850 - 1980*:

For Britain, Wiener argues that, after the Great Exhibition of 1851, "social and psychological currents began to flow in a different direction" (p157). "The emerging culture of industrialism ... was itself transformed. The thrust of new values borne along by the revolution in industry was contained

in the later nineteenth century; the social and intellectual revolution implicit in industrialism was muted, perhaps even aborted" (p157). "For a century and a half the industrialist was an essential part of English society, yet he was never quite sure of his place. The educated public's suspicions of business and industry inevitably colored the self-image and goals of the business community. Industrialists responded to their mental environment, sometimes by seeking to leave the world of production for more acceptable realms of gentility, and sometimes by striving to adapt their way of life to the canons of gentility. ... As a rule, leaders of commerce and industry in England over the past century have accommodated themselves to an elite culture blended of preindustrial aristocratic and religious values and more recent bureaucratic values that inhibited their quest for expansion, productivity, and profit" (p.127). The gentrification of the industrialists discouraged "commitment to a wholehearted pursuit of economic growth" (P.127) and led to "the waning of the industrial spirit" (P.159) or the capitalist spirit.

VII. Concluding Remarks

This paper has shown that a strong capitalist spirit can lead to unbounded growth of consumption and capital even though the net marginal product of capital is less than the time discount rate or goes to zero when capital stock increases to infinity. In doing this we have relaxed the technology condition required in many endogenous growth models and at the same time integrated two approaches to economic growth and development --- the production technology approach and the cultural approach --- into a single model.

While we have mainly focused on the role of capitalist spirit in

generating long-run growth, we want to emphasize that our model is strictly complementary to many existing models which have more or less concentrated on the technology and productivity progress. In fact, as the capitalist spirit model just adds a cultural element to the existing models, it can embody all the contributions by both the traditional growth theory and the new growth theory. It is a mistake to totally ignore the cultural elements in economic growth and development, but it is a blunder to just talk about culture without putting technology in its right place. This is why Morishima (1982) explains the successful story of Japan by two factors: Western technology and Japanese Confucianism. The balance between culture and technology should be always maintained.

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Appendix

Here we prove Propositions three and four.

For proposition three, we only need to show that the terms in the parentheses of equation (31) is positive. Suppose not, then:

$$(\beta + 1) < \frac{[(\beta+1)\theta - 2\rho](\beta+1) + 2(2+\beta)\rho}{\sqrt{[(\beta+1)\theta-2\rho]^2 + 4(2+\beta)\theta\rho}} \quad (A1)$$

For $\theta > 0$, the numerator on the right hand side of (A1) is positive, so both sides are positive. Take square on both sides, and cross multiply:

$$(\beta+1)^2 \{ [(\beta+1)\theta-2\rho]^2 + 4(2+\beta)\theta\rho \} < \{ [(\beta+1)\theta-2\rho](\beta+1) + 2(2+\beta)\rho \}^2 \quad (A2)$$

Expand the expression:

$$\begin{aligned} (\beta+1)^2 [(\beta+1)\theta-2\rho]^2 + (\beta+1)^2 (2+\beta)4\theta\rho < (\beta+1)^2 [(\beta+1)\theta-2\rho]^2 + (\beta+1)^2 (2+\beta)4\theta\rho - \\ - 8\rho^2(\beta+1)(2+\beta) + 4\rho^2(2+\beta)^2 \end{aligned} \quad (A3)$$

Namely,

$$0 < - 8\rho^2(\beta+1)(2+\beta) + 4\rho^2(2+\beta)^2 \quad (A4)$$

or

$$0 < 4\rho^2(2+\beta)(2+\beta-2\beta-2) \quad (A5)$$

$$0 < - 4\beta\rho^2(2+\beta) \quad (A6)$$

Inequality (A6) is a contradiction for both β and ρ are positive, and the right hand side is negative. Hence the right hand side of equation (31) is positive.

Next we show that the terms in the parentheses of equation (33) is positive, which is the same as:

$$(\theta+2\rho) + \sqrt{[(\beta+1)\theta-2\rho]^2 + 4(2+\beta)\theta\rho} > \frac{(2+\beta)(\beta+1)\theta^2}{\sqrt{[(\beta+1)\theta-2\rho]^2 + 4(2+\beta)\theta\rho}} \quad (A7)$$

Multiply both sides by the positive number $\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho}$, and simplify:

$$(\theta+2\rho)\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho} + 4\rho^2 + 4\theta\rho > (\beta + 1)\theta^2 \quad (A8)$$

But the left hand side of inequality (A8) is the same as:

$$\begin{aligned} (\theta+2\rho)\sqrt{(\beta+1)^2\theta^2+4\rho^2+4\theta\rho} + 4\rho^2 + 4\theta\rho &> (\theta+2\rho)(\beta+1)\theta + 4\rho^2 + 4\theta\rho > \\ &> (\beta + 1)\theta^2 \end{aligned} \quad (A9)$$

which is just what we need to prove.

To show that (34) is positive, we need:

$$\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho} < \frac{(2+\beta)(\beta+1)\theta^2}{\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho}} + (\theta+2\rho) \quad (A10)$$

or:

$$[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho < (2+\beta)(\beta+1)\theta^2 + (\theta+2\rho)\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho}$$

Cancel terms on both sides:

$$4\theta\rho^2 + 4\rho^2 < \theta^2 + \beta\theta^2 + (\theta+2\rho)\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho} \quad (A11)$$

This is definitely true because:

$$\begin{aligned} (4\theta\rho^2 + 4\rho^2)^2 &< (\theta + 2\rho)^2(4\theta\rho^2 + 4\rho^2) = (\theta^2 + 4\theta\rho^2 + 4\rho^2)(4\theta\rho^2 + 4\rho^2) \\ &< \{ \theta^2 + \beta\theta^2 + (\theta+2\rho)\sqrt{[(\beta+1)\theta-2\rho]^2+4(2+\beta)\theta\rho} \}^2. \end{aligned} \quad (A12)$$

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