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Can Increased Intermediation Impede Growth?

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September 1990

Can Increased Intermediation Impede Growth?

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ABSTRACT

Can Increased Intermediation Impede Growth?

The regulation of intertemporal consumption decisions may be more critical a function of a growth promoting financial sector than the efficient allocation of savings between investment projects usually cited. Using standard analytics the paper begins establishing the possible incompatibility of pareto optimality and growth. It then demonstrates using a two period dynamic model in a Nash framework that in an economy where agents earn their incomes from differing endowments of labor and capital, increases in investment by "capitalists" will be partially offset by an increased desire for consumption by wage earners. It follows that development policies designed to increase capital accumulation will be frustrated by this offset, and that a sudden liberalization of consumption borrowing may result in dramatic falls in savings rates. A theoretical rationale is thus provided for both the restrictions on consumer credit visible in many Asian NICs as well as the consumption boom observed during the 1970's Chilean liberalization experiment.

I. INTRODUCTION

In this paper we argue that the critical function of a growth promoting financial structure may be the regulation of intertemporal consumption decisions, rather than the efficient allocation of savings between investment projects usually emphasized by Fry (1980,1982), Galbis (1977), McKinnon (1973,1976) and others. In particular we demonstrate the existence of a savings reducing externality arising from the accumulation process itself that is likely to impede growth in the absence of institutional constraints on consumer borrowing.

Our results build on the often overlooked but theoretically almost self-evident result that growth and pareto optimality can be incompatible goals and that the market rate of interest can retard as often as promote capital accumulation.[1] Using relatively simple analytics, we begin showing that "intertemporal trade" arising from increased intermediation can be growth reducing under many non-pathological assumptions about technology, endowments and agents preferences.

We then demonstrate, using a simple dynamic two period, two agent model in a Nash framework, that the normal process of capital accumulation must generate such a growth reducing outcome through an increased tendency to consume against future income by certain classes of agents irrespective of their subjective rates of discount. In an economy where otherwise identical agents, earn their income from differing endowments of labor and capital, increases in investment by

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[1] We sidestep the question of the optimal rate of growth given the inability of absent future agents to participate in current credit markets. See Sen(1984), Deaton(1988). Blanchard(1989) argues that even in a context of overlapping generations models, the market equilibrium will still not be the same as a planner maximizing utility of all agents across time.

"capitalists" will be partially offset by an increased desire for consumption by wage earners due to both a rise in the marginal product of their labor and a fall in returns to capital. Not only is it then straightforward to show that development policies designed to increase capital accumulation will be frustrated by this offset, but that sudden liberalization of consumption or mortgage borrowing may result in dramatic falls in savings rates.

Treatment of the subject of non-investment related borrowing in the financial development literature has been undeservedly sparse considering the provocative range of country experiences over the last twenty years. Chile's 1976-82 unsucessful experiment with completely unregulated capital markets saw real rates of interest far above feasible returns to productive capital, partially due to a boom in consumer demand for credit.[2] Japan and Korea provide disquieting counter examples with their combination of repressed and dualistic financial sectors and stellar growth rates.[3] In these countries, investment borrowing was provided a safe subsidized haven with a steady source of savings while non-investment spending, including consumption, was delegated to informal sector markets at much higher rates.[4] These institutional features preventing the consumption crowding out effect we derive, rather than frequently invoked cultural characteristics, may be critical to understanding savings rates in these countries.

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[2] Schmitt-Hebel(1987), Corbo(1985)

[3] Feldman (1985), Suzuki (1986), Cargill and Royama (1988) Greenwood (1988), Cole and Park (1978)

[4] The suggestion by the Japanese representative at the recent April 1990 bilateral trade talks that the U.S. restrict consumers to two credit cards confirms that they view regulation of consumer borrowing an important policy instrument even for developed countries.

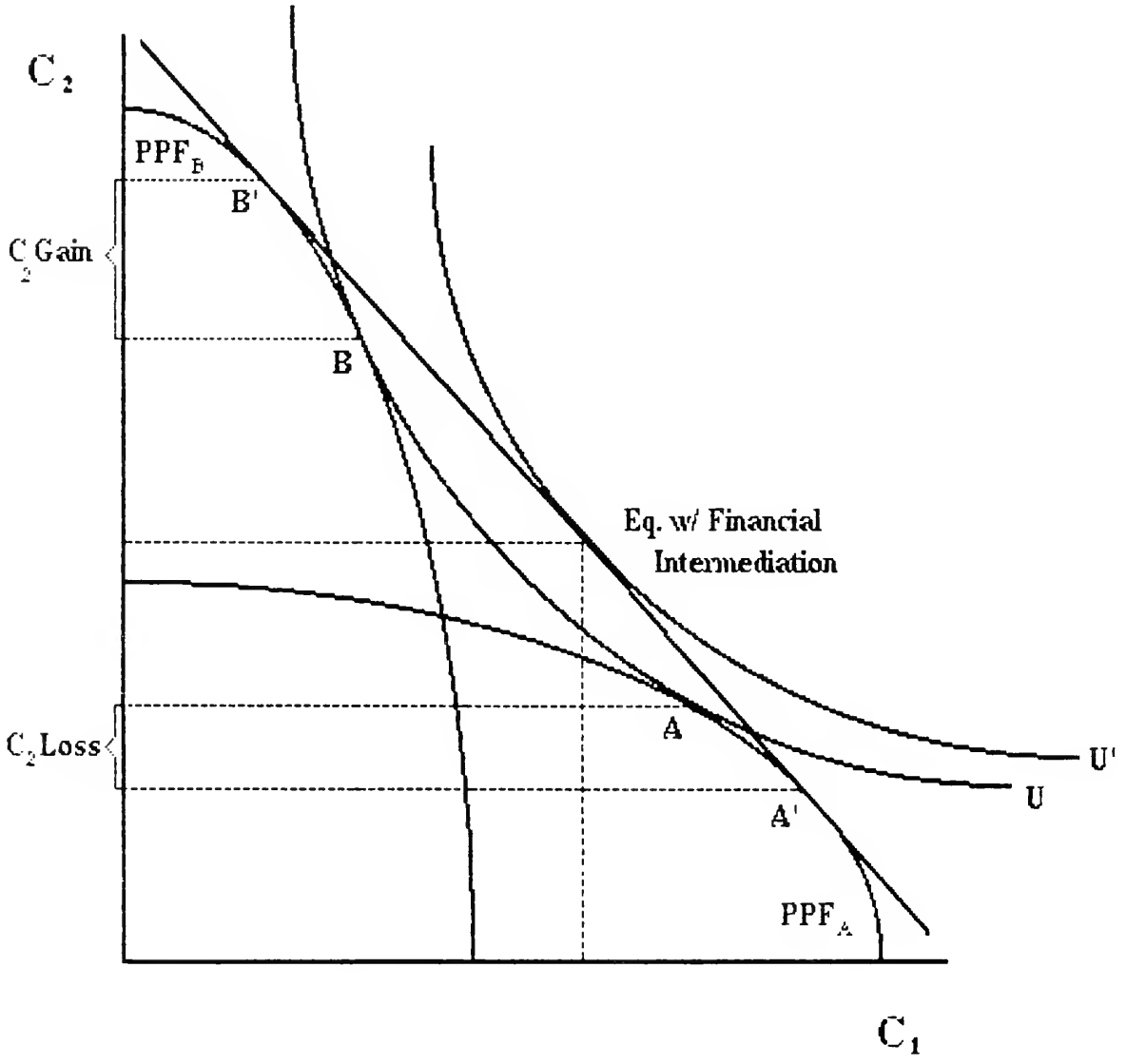
II. FINANCIAL INTERMEDIATION

The literature frequently assumes a unitary representative agent, the archetypal capitalist, or multiple agents with homogenous preferences who allocate an initial endowment across time subject to expected returns to investment. However, only with differentiation of actors either in endowments, technology or preferences are there gains from financial intermediation. Drawing on relatively simple analytics, it is straightforward to show the efficiency gains on which McKinnon based his advocacy of increased intermediation as critical to economic development defined as "reducing the great dispersion in social rates of return to investment" visible in most LDC's.[5] Graph 1 shows how both the efficiency of capital and the welfare of two identical agents facing different technologies or endowments can be enhanced by intertemporal "trade." It is also clear that this pareto improvement does not necessarily imply higher levels of growth. Depending on the preferences of our identical individuals and the particular technologies, the losses in second period consumption, C_2 may exceed gains.

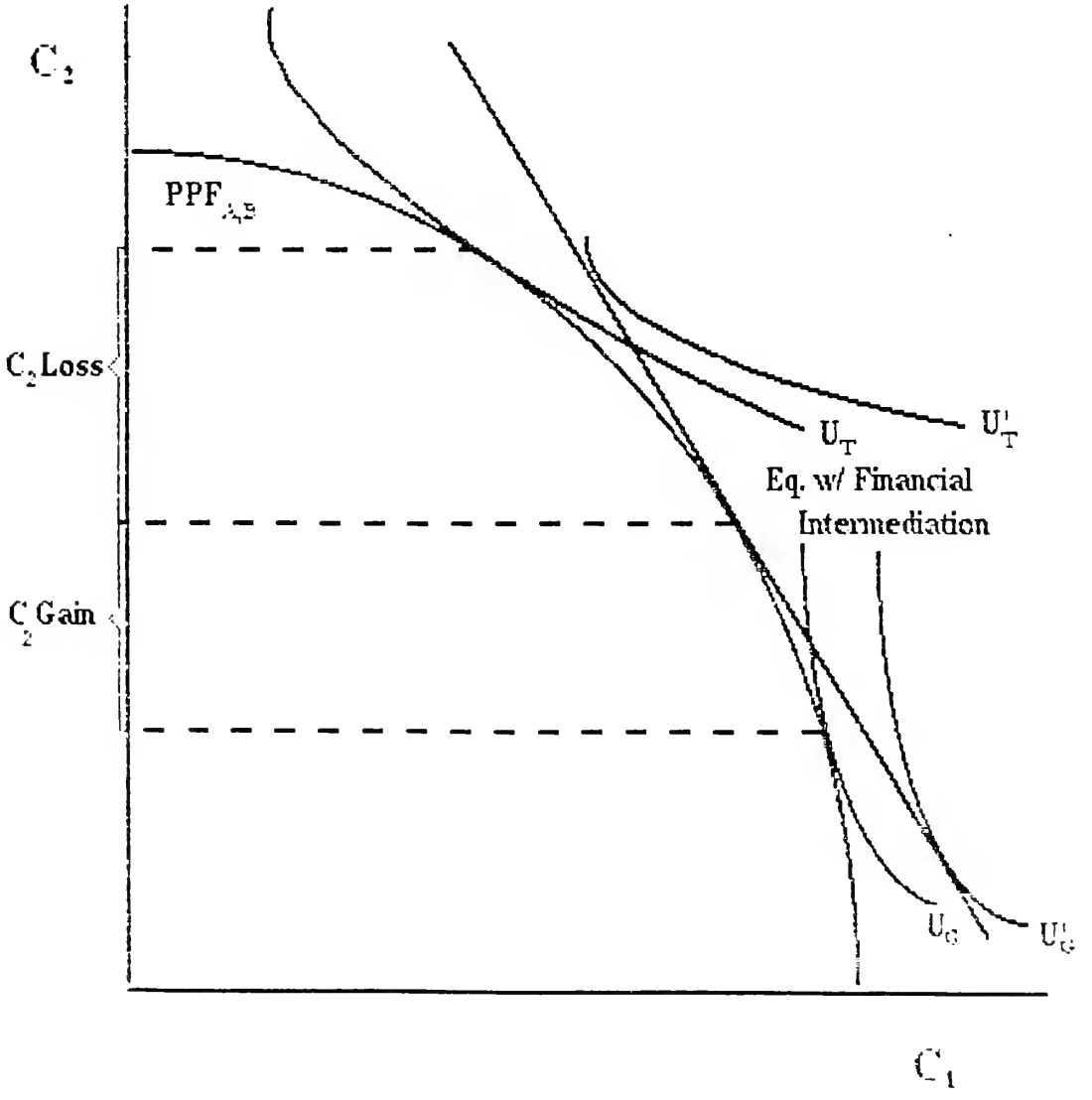
A case more relevant to our argument is that of a thrifty agent with strong preference for second period consumption and a greedy agent favoring consumption this period facing identical technologies. Again, as graph 2 shows, intermediation allows both agents now reach a higher level of utility but the quantity of second period consumption, C_2 may fall. This effect becomes more dramatic with the introduction of a second period endowment or more generally, an alternative source of income to capital rents. As graph 3 shows, our greedy agent can now dissave. In arguing for greater intermediation, we generally envision

[5] P. 9 McKinnon(1973).

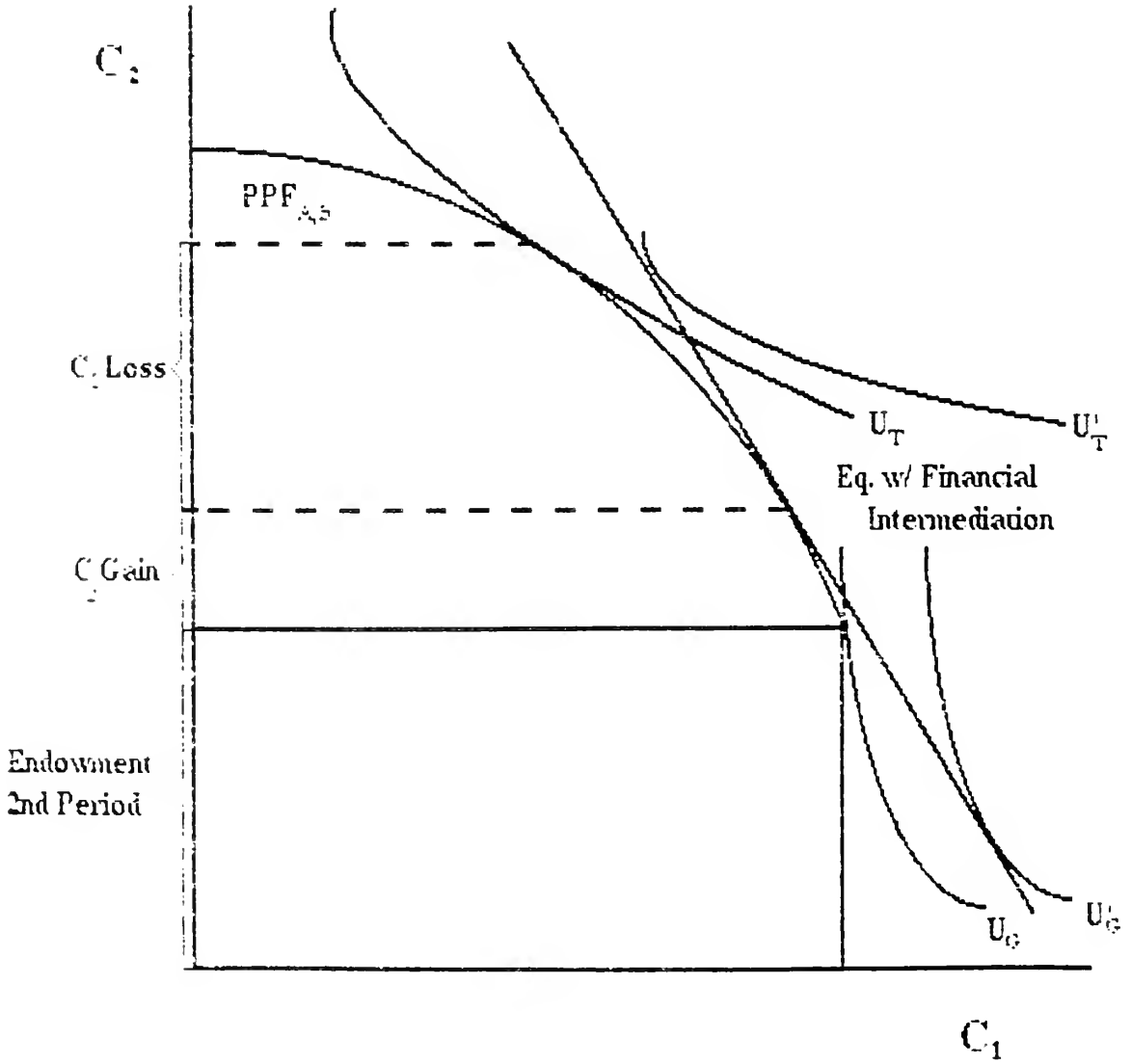
Graph 1
Financial Intermediation with
Differing Technologies



Graph 2
Financial Intermediation with
Differing Preferences



Graph 3
Financial Intermediation with
Differing Preferences and
2nd Period Endowment



only the isolated entrepreneur now able to realize investment plans because of increased access to credit. Just as easily, however, we may find consumers with rates of subjective time preferences exceeding any feasible return to capital now competing for investible resources who previously would have been forced to live within their means each period.[6] Increased financial intermediation in this context may lead to a pareto superior outcome, but may not deliver the higher growth rates promised.

The model presented in the next section shows how in the normal process of capital accumulation a class of greedier actors with second period "endowments" naturally arises. Within a general equilibrium framework we add to our archetypal capitalist a second actor with identical preferences who derives her second period income not only from capital rents on first period consumption deferred, but also from returns to her labor, effectively a second period endowment. Her optimal, rational behavior will tend to offset increases in investment by capitalists because of a resulting double disincentive to savings: a fall in the marginal return to first period consumption deferred and an expected rise in future income from wages. We may find casual support for such "consumption crowding out" in the observed inverse relation in the U.S. between corporate and personal savings known as "Denison's Law" of relatively constant private savings as a fraction of GNP (Denison 1958).[7] We show the offset can be complete under certain assumptions

[6] Thayler and Shefrin(1981) cite estimates of subjective rates of discount between 25-122%, far above a relevant rate of interest. They argue that self-imposed or institutionally imposed borrowing constraints such as Christmas clubs or bonus pay schemes in Japan serve to keep savings rates higher than would be expected given estimated SRD's.

[7] David and Scadding(1974) extend Denison's work and find the same relation across from 1868-1968. Further they find that over the same period that there has been a shift away from personal savings toward corporate savings within gross savings.

and is positively related to labor's share in GNP making it a particularly relevent effect in developing economies. We further argue that in situations where consumer access to markets has historically been denied, an accumulated repressed demand for consumption credit may suddenly compete with investors upon liberalization of financial markets that may lead to a substantial fall in savings and net investment that dwarfs expected efficiency gains.

III. A DYNAMIC TWO AGENT MODEL

A. The General Case

Our economy is populated by two representative agents who live for two periods and differ only in initial endowments of capital and labor. They either consume or invest the single good in period one and consume everything in the second period. The agents exhibit identical utility and perfect forsight, but derive their income in different proportions from capital and from wages. The agents' decisions to accumulate capital or consume are interdependent since both depend on the marginal product of the total stock of capital which includes investment of both labor and capital. Following Sargent (1987) we derive the Nash equilibrium for this two player dynamic or differential game with no randomness.

We assume an aggregate well behaved production function exhibiting constant returns to scale in its two inputs, capital (K) and labor (L)

$$1)\ Q = F(K,L):\ f(0) = 0,\quad f(\infty) = \infty,\quad f' > 0,\quad f'(\infty) = 0$$

Labor (L) supplies L units of labor in period 1 and period 2 and begins with no capital but can accumulate during period 1 by consuming less than it earns. The Capitalists (K) possess no labor, K_0 units of capital and may accumulate in the same manner K_{1K}. Both are also subject to the constraints:

$$\text{i.} \quad (K_0, L) = C_{1K} - K_{1K} + C_{1L} - K_{1L}$$

Total first period output goes either into first period consumption by labor or capitalists (C_{1K}, C_{1L}) or investment (output carried over to period 2) by labor or capitalist (K_{1K}, K_{1L}). And

$$\text{ii.} \quad F(K_1, L) = C_{2K} + C_{1L}$$

Second period output is consumed by capitalists C_{2K} or labor (C_{1L}). Both agents maximize their identical intertemporal utility functions in first and second period consumption C_1 and C_2 and the subjective rate of time preference ß.[8]

$$2) \quad U(C_1) + ß*U(C_2)$$

$$3) \quad U' > 0, \quad U'' < 0, \quad U'(0) = \infty,$$

given L and K_0 **and the investment choices of the other agent**. Given K_{1L}, each choice of K_{1K} will imply a different C_{1L} and that given

[8] It has been established that for the kinds of problems we are studying the maximization problem the planner faces is identical to the one each a representative consumer faces, thus the solutions reached by the planner or the single agent are equal (a presentation of this can be found in Milton Harris, 1987). We can restrict the analysis to the problem the planner faces without loss of generality.

K_{1K}, each choice of K_{1L} will imply a different C_{1K}. Alternative assumptions about how player 1 imagines player 2 to choose determine the equilibrium concept of the game. Our particular version of a Nash equilibrium will assume that player 1 takes player 2's actions as given and beyond player 1's control and player 2 takes a symmetrical view of player 1's actions. Both agents seek to maximize their consumption with respect to their investment in period 1 conditioned on the other agents decision which allows the first and second period material balance equations to serve as budget constraints. Substituting in, we get the Euler's equation:

$$4)\ U'(F(K_0,L) - K_{1K} + C_{1L} - K_{1L}) = B*U'(F(K_L,L) - C_{1L})*F'_{K,2}$$

To find the consistent equilibrium we derive the reaction functions $K_{1K}(K_{1L})$, $K_{1L}(K_{1K})$ for both capitalists and labor. At the Nash solution each set of agents is behaving optimally given the other's actions.

1. Derivation of the Reaction Functions for Capitalists.

Since agents receive their marginal product:

$$5)\ F(K_1,L_0) - C_{1L} = K_{1K}*F'_{K,2}$$

and we can rewrite equation 4 as

$$6)\ U'(F(K_0,L_0) - K_{1K} + C_{1L} - K_{1L}) = U'(K_{1K}*F'_{K,2})*F'_{K,2}$$

An additional unit of investment by labor lowers next periods return on investment $F'_{K,2}$. This lowers both next period's capitalist's income (income effect) and return on investment (substitution effect). The income effect makes capitalists increase investment to equalize the marginal utility of tomorrow's income with today's while the substitution effect lowers it by making investment less profitable. We will assume, as is common in the literature, that the substitution effect dominates.

2. Derivation of the Reaction Functions for Labor.

Labor's problem differs critically because workers receive income not only from savings (investment) that it carries from period 1 to 2, but also from wages, the marginal revenue product of labor. Therefore

$$7)\quad F(K_1,L) - C_{1K} = K_{1L}*F'_{K,2} + L_0*F'_{L,2}$$

and we can rewrite equation 8 as

$$8)\quad U'(F(K_0,L) - K_{1L} - C_{1K} - K_{1K}) = B*U'(K_{1L}*F'_{K,2} + L*F'_{L,2})*F'_{K,2}$$

Investment by the capitalists brings about an increase in $F'_{L,2}$ and a fall in $F'_{K,2}$, which increases next period's labor's income (income effect) and lowers their next period return on investment (substitution effect). Both effects of capital's investment together unequivocally reduce labor's investment:

$$9)\ \delta(K_{1L})/\delta(K_{1K}) < 0\ .$$

This offsetting behaviour by labor is the effect we desire to contrast to the case of homogenous agents, where investment by one implies investment by all. It is emphatically not the case that people are myopic and do not see that their future income is contingent on their rate of savings now nor is it an externality in the strict sense of the term. Rational agents, observing increased investment by capitalist upgrade their estimate of next period's incomes and consume more now.

B. NASH SOLUTION WITH COBB-DOUGLAS PRODUCTION FUNCTION AND LOGARITHMIC UTILITY FUNCTION.

Employing Cobb-Douglas Technology and logarithmic utility yeilds particularly transparent reaction functions and permits simple graphical analysis. Let

$$10)\ F(K,L)= K^{a}L^{1-a}$$

and

$$11)\ U(C)=\log(C).$$

1. Optimal Investment Reaction Function for Capitalists

Equation 4, the Euler equation for the capitalists, now has the form

$$12)\ (1/C_{1K})=(1/C_{2K})*aK_{1}^{a-1}L^{1-a}$$

In the first period Capital's consumption is the residual of investment by both actors and consumption by labor

$$13)\ C_{1K} = F(K_0, L) - K_{1K} - C_{1L} - K_{1L} = K_0 a L^{1-a} - K_{1K} - C_{1L} - K_{1L}$$

In the second period capitalists consume both the return and the actual capital.

$$14)\ C_{2K} = B*F'_{K,2}*K_1 = K_{1K}*aK_1^{a-1}L^{1-a}$$

Equation 16 can now be re-written as

$$15)\ (1/[K^aL^{1-a} - K^{1K} - C^{1L} - K^{1L}]) = B*(aK_1^{a-1}L^{1-a})/[K_{1K}*aK_1^{a-1}L^{1-a}]$$

which reduces to

$$16)\ K_{1K} = [B/(B+1)]*(K_0 a L^{1-a} - C_{1L} - K_{1L})$$

$$17)\ \delta K_{1K}/\delta K_{1L} = [B/(B+1)]*(-\delta C_{1L}/\delta K_{1L} - \delta K_{1L}/\delta K_{1L}) = [B/(B+1)]*(1-1) = 0$$

Note that $\delta C_{1L}/\delta K_{1L}$ is equal to -1 because every unit labor invests in period 1 must be matched with an equal reduction in their consumption that period. $\delta K_{1K}/\delta K_{1L} = 0$ implies that under the current

specifications of the production and utility functions, investment of capitalists does not depend in the investment pattern of labor. This is reflected in Graph 4 as the vertical line R^K. The decrease in F' resulting from an increase in investment by labor that might lead to an increase in consumption in period 1 is exactly offset by the increase in utility resulting from the fall in income in period 2. Capitalists' investment is bounded by the interval (0,QK), where QK is capitalists total income in period 1.

2. Optimal Investment Reaction Function for Labor.

An almost identical derivation yeilds the reaction function for labor:

$$18)\quad (1/C_{1L})=(1/C_{2L})*aK_1^{a-1}L^{1-a}.$$

Given that

$$19)\quad C_{1L} = F(K_0,L) - K_{1K} - C_{1K} - K_{1L} = K_0^{a}L^{1-a} - K_{1L} - C_{1K} - K_{1K}$$

$$20)\quad C_{2L} = K_{1L}*F'_{K,2} + L*F'_{L,2} = K_{1L}*aK_1^{a-1}L^{1-a} + L*\ (a-1)K_1aL^{-a}$$

equation 22 can be re-written as

$$21)\quad (1/[K_0aL^{1-a}-K_{L1}-C_{1K}-K_{K1}])= B*(aK_1^{a-1}L^{1-a})/[K_{1L}*aK_1^{a-1}L^{1-a} + L*(a-1)K_1aL^{-a}]$$

which reduces to

$$22)\quad B*(K_0aL^{1-a} - K_{1L} - C_{1K} - K_{1K}) = K_{1L} + (1/a)*(1-a)*K_1$$

Differentiating the above expression:

$$23)\ B*(\delta K_{1L} - \delta K_{1K} + \delta K_{1K}) = \delta K_{1L} + (1/a)*(1-a)*(\delta K_{1L} + \delta K_{1K})$$

Note that $\delta C_{1K}/\delta K_{1K} = -1$ because every unit capitalists invest in period 1 must be matched with an equal reduction in their consumption that period. Further simplification gives:

$$24)\ \delta K_{1L}/\delta K_{1K} = (a-1)/(Ba+1) < 0.$$

This algebraically confirms our previous intuition that for labor the combined substitution and income effect are negative, and the resulting reaction function, depicted as line RL in graph 4, must have a negative slope. Labors' investment is bounded by the interval $(-Q_K, Q_L)$, where $Q_L >= K_{L1}max$ (Q_L is labors' total income in period 1). The negative lower bound reflects the fact that workers receive payment to their labor in period 2 even if they invest nothing in period 1. This income allows them to incur in consumption debts (negative investment) with capitalists and pay with their period 2 wages.

3. Equilibrium

The intersection of R^L and R^K defines the unique Nash equilibrium. It is immediately apparent that labor saves(invests) less as capital saves (invests) more and that there exists a level of investment by capitalists sufficiently large, at point **B**, that labors' optimal

reaction is to invest zero and beyond this point, to borrow against future earnings.

C. EXTENSIONS

1. Policies to Increase Investment

Investment increasing policies, be they increasing foreign aid, liberalization of the financial sector, or tax reforms, that seek to shift the R^K line to the right are bound to be frustrated to the degree that workers react by reducing their savings or borrowing to consume, represented by the slope of R_L. This can be shown to be less than 45° independent of the specific formulation of the production and utility functions so investment can never be more than "crowded out" though it could be completely offset. From equation 24 we see that the offset effect under Cobb Douglas Technology is proportional to (1-a), the share of labor in output.

2. Tax and Subsidy Policies

A tax on wages to maintain them at present levels forever would remove income effect and hence thwart the offset though it would seem at odds with the overall goal of raising incomes. Returning the taxes with interest at a later date would work only if agents could not borrow against these earnings in the capital markets such as appears to be the case in Singapore[9]. A subsidy on investments would shift both the RL and RK curve to the right, delaying, but never eliminating the offset or the eventual borrowing against future earnings by workers.

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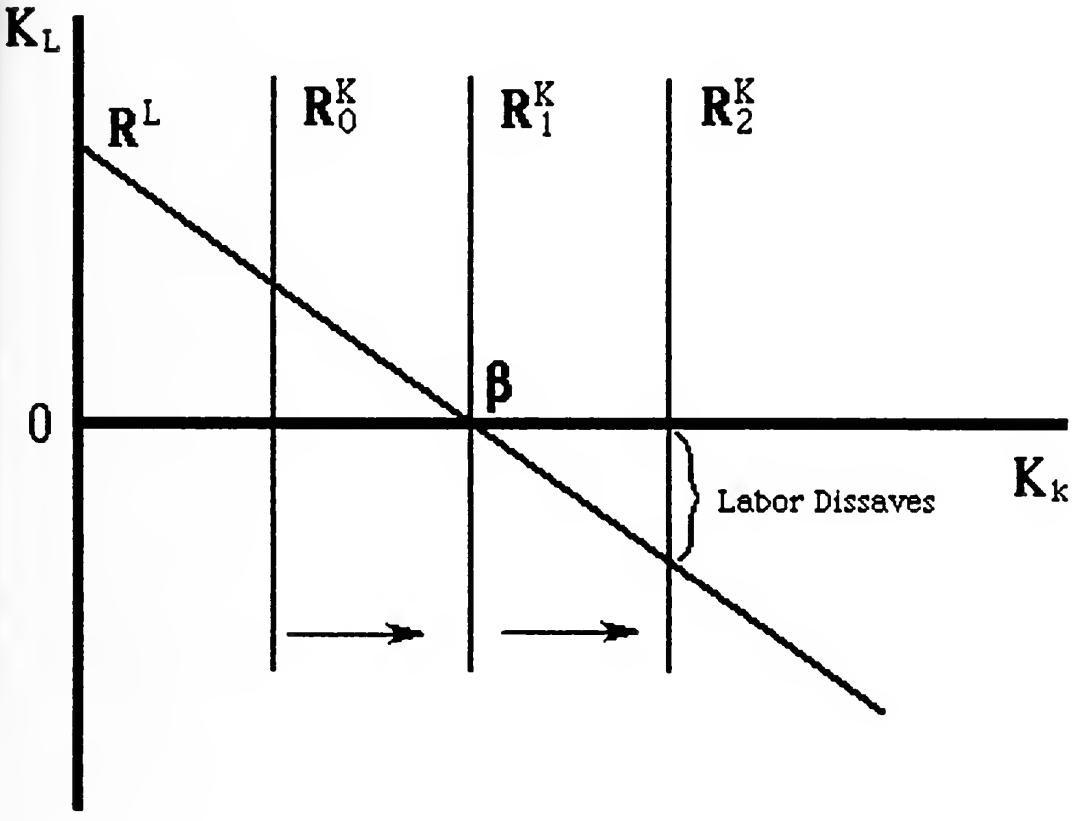
[9] Kraus 1987

Graph 4
Nash Equilibria
Reaction Functions for Labor and Capital



R^L --Reaction function for Labor

R^K --Reaction functions for Capital

3. Consumption Rationing

In equilibrium to the left of **B** where labor still saves permits of no constructive intervention in credit markets. However, to the right of **B** where borrowing against future income occurs, a policy of restricting consumer credit forces consumers off their reaction function to where they must live within their means each period. This clearly implies a pareto inferior solution for consumers but is savings, hence growth, enhancing. While cultural characteristics have been credited with the extremely high savings rates, particularly in East Asia, the existence of **Sarakin** (informal credit markets) in Japan and an active curb market at very high real rates in Korea suggest that central bank policies restricting consumer credit were binding and that demand existed for credit that would have competed for investment resources critical to the accelerated growth strategies these countries pursued.

4. Liberalizing a Repressed Financial Sector

Liberalizing a repressed financial sector under such circumstances is clearly not without peril. Far from raising the rate of savings as is usually assumed, workers will move to their reaction function and consume more, depressing the overall savings rate. Schmitt-Hebel(1989) assigns 30% of the increase in consumption demand in 1979-82 Chile precisely to the increased availability of credit suggesting repressed demand beforehand. Part of the recent surge in Japanese consumer spending has been attributed to the spending of savings which in absence of mortgage finance, were for future housing purchases now made infeasible by astronomical real estate values.[10] Were mortgage

[10] The Economist, September 9, 1989

financing abundantly available as in the US, Japan would probably not have generated saving rates at its previously high level.[11]

5. Culture and the Subjective Rate of Time Preference

Our purpose is not to dismiss cultural determinants of savings in these countries. Varying degrees of societal greediness can be incorporated in the subjective rate of discount parameter B. A low SRD, representing perhaps a thrifty traditional society would rotate the RL curve up decreasing consumption and increasing worker investment for every level of capitalist investment. Such economies would enjoy a long period of investment by capitalists before demands for consumer credit begin to compete for investment funds. Conversely societies strongly affected by the "demonstration effect" or a high B may find themselves short on savings early in the development process. The point is rather that in the process of growth itself resides a natural dynamic toward the diminution of savings and that some institutional contraints on free capital markets may be desirable to ensure sufficient investment resources.

IV. CONCLUSIONS

Once the decision has been made to pursue a high growth strategy in spite of possible welfare losses to the current generation, the financial sector becomes an important tool for ensuring a compatible intertemporal allocation of investment resources. We have shown using simple analytics that any situation of financial autarky where welfare can be improved by increased intermediation can easily lead to a decline

[11] In 1975, The share of Installment Mortgage + Consumer Credit in GNP in 1975 totaled 16% in 1975 vs. 51% in the US. In 1975, 5.7 of all Japanese bank loans were consumer loans rising to 8% in 1985.

in the level of savings, and hence investment. It is then shown that in an economy with actors with differing asset endowments, there is a natural tendency toward lower savings rates that is exacerbated when expected growth rates are high, or in the presence of demonstration effects or uncertainty about the permanence of reform programs. While the offset effect can be somewhat clumsily reduced by tax policies, direct restrictions on consumer credit seem more effective. Further, if financial markets are liberalized where there exists sizable pent-up demand for consumer credit, a predictable loss in investable resources may result that dominates any increase in efficiency. The standard arguments in favor of increased intermediation are thus incomplete and deserving of strong caveat while a theoretical justification emerges for the heavily regulated financial structures of the East Asian NICS.

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