Why Was Japanese Investment so High ? : A Preliminary Note on Managerial Incentive Mechanism

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I. Introduction

It has been a major issue of macroeconomic analysis why investment rate (or saving rate) in Japan is so high among developed economies. Above all, it must be clarify the meaning of "high" — To what is it "high" as compared ?

The recent most popular (and standard) theory on the investment decision is the Euler equation approach, which will provide a prospective basis for further study on the issue. An answer for "high" investment rate derived from this optimization-based theories would be that there was a mechanism of reducing investment cost : for example, the main bank system reduced agency cost effectively, so that it stimulates the investments of Japanese firms.

In this note, we would like to offer a new story, which may explain high-investment in Japan from an incentive theory's viewpoint. We stress on the impacts of their preference or personal interests upon the investment decisions, which have not been studied sufficiently so far. And we will try to give some empirical evidence to support our conjecture.

II. Theoretical Framework

A. Backgrounds

The econometric literature on investment is voluminous and there are many excellent surveys. Hence we will merely discuss the problem related to our main idea presented in this note.

Giving a rough outline of the recent empirical studies, it has been a main issue how to explain the residuals which is not interpret systematically by the orthodox theory, such as Tobin's q or Euler equations. In other words, the data did not fit the investment functions derived from these theories in many cases. Therefore, some qualifications became required to explain the gap, by which probably the firm was prevented from taking optimal behavior.

Some examples of qualifications of constraints for investment equation based on Tobin's q

theory are, Fazzari, Hubbad and Petersen [1988] which explained by cash flow; Hoshi, Kashyap, and Scarftein [1991], *Keiretsu* relations; Okazaki and Horiuchi [1990], main bank relations; and Athey and Laumas [1994], net-profits and depreciation.

Our assertion, formally presented in the following sub-section, is that executive rewards may explain the distortion on the investment. More precisely, investment decision may suffer from the distortion, because the managers consider their personal pecuniary rewards in decision making, if executive rewards depend on the investment. And if executive rewards were related to the investment positively, high-investment in Japan would be explained by it, even partially.

B. A Managerial Preference Approach to the Investment Theory

A manager is assumed to maximize his pecuniary rewards M, which depend on short-term profits R and firm size determined by the capital stock of the firm K:

$$MAX_{(K_t, I_t)} U_t \equiv E_t[\sum_{s=t}^{\infty} \beta^*_{t,s} M_s], \quad \beta^*_{t,s} \equiv \prod_{j=t+1}^{s} \beta_j$$

$$M_s = M(K_s, R_s), \quad \partial M/\partial K_s > 0, \quad \partial M/\partial R_s > 0,$$

$$R_s \equiv F(K_{S-1}) - C(I_S, K_{S-1}) - P_S^I I_S, \quad F' > 0, \quad \partial C/\partial I_S > 0, \quad \partial C/\partial K_{S-1} > 0,$$

$$\textit{subject to } K_S = (1-\delta) K_{S-1} + I_S,$$

where E[ ] is expectation operator; M, real rewards to a manager; β, discount factor of a manager; R, real short-term profits of a firm; F, production function of a firm; K, capital stock; I, investment; C, net cost of investment; and δ, the depreciation rate on the firm's capital stock.

Thus, the capital stock at t does not become productive until period t+1. Therefore a manager gets reward from the future productivity through K_t.

To solve this constrained optimization problem, we define the Lagrangian

$$\mathcal{L}_t \equiv E\{\sum_{s=t}^{\infty} \beta^*_{t,s}[M(K_S, R_S) - \lambda_s[K_S - (1-\delta)K_{S-1} - I_S]]\}.$$

Setting $\partial \mathcal{L}_t/\partial I_t = 0$, $\partial \mathcal{L}_t/\partial K_t = 0$, the first order conditions are,

$$M_R(C_{I_t} - P_t^I) = \lambda_t,$$

$$E_t \beta_{t+1} M_R(F_{K_t} - C_{K_t}) + M_K = \lambda_t - (1-\delta) E_t \beta_{t+1} \lambda_{t+1}.$$

Eliminating λ_t and λ_{t+1}, we obtain the equation which derives equilibrium investment and capital stock.

$$(1) \qquad E_t \beta_{t+1}[(F_{K_t} - C_{K_t}) + (1-\delta)(C_{i_{t+1}} + P_{t+1}^I)] = (C_{i_t} + P_t^I) - M_K/M_R.$$

This is the almost same of the typical condition in the literature, except the term of $-M_K/M_R$: it equates the net expected marginal return on capital in period t+1 to the full cost of acquiring and installing a unit of the capital good, adjusted by the marginal rate of substitution of the manager.

Now, substitute the optimal investment and capital stock to (1), then we can get managerial rewards schedule at equilibrium, when the production function and the cost function need to be specified for the investment Euler equation.

Through the term of $-M_K/M_R$, the derived investment level is influenced by the managerial compensation. When managerial rewards does not reflect capital stock (future productivity),

$M_K = 0$, there is no bias on investment decision. However if $M_K > 0$, then it reduces the costs of capital in terms of manager's utility, and it brings about over-investment. Therefore, it is a point whether managerial rewards affect the investment significantly.

III. An Empirical Result

A. The Data

Our data set used in this study is came from *the Japan Development Bank Corporate Finance Databank* for 1982-1994 (See Izawa *et. al.* (1994) for the details of the data). The data are collected for the about 1, 800 companies (excluding finance and insurance companies) listed on the first and second sections of the Tokyo, Osaka and Nagoya Stock Markets, based on their annual securities.

It is the unique feature of Japanese financial statements that director's salaries and bonuses are reported separately, while in the United States, both of managerial rewards are added together according to SEC standards. In Japanese financial statements, the director's salary is included in "general administrative and selling expenses", and the director's bonuses are included in "appropriation of profit", that must be approved in general meeting of stockholders.

B. Regression Results

It is well known that several trouble issues will arise when estimating the Euler equations (See Oliner *et al.* [1996], for the issues arise in the estimation of Euler equation model). And unfortunately their empirical performance is very poor. Therefore we try to see whether managerial rewards affected the investment decision by panel analysis, avoiding the estimation of the Euler equation.

TABLE I Effects of Executive Rewards on Investment Decision

Dependent : Growth Rate of Investment

	Pooling	Between	Within	Variance Components
Executive wage plus bonus	.129313	−1.12646	.257274	.195044
	(.414771)	(−1.07878)	(.788417)	(.646056)
Growth Rate of Profits	.830251E-03	.776792	−.097439	−.049567
	(.018582)	(5.71382)	(−2.06819)	(−1.14138)
adjusted R^2	.770618E-03	.020482	.105177	.056521

NOTE : NOB=18556, Figures in parentheses denote t-value.

Table I, II, and III summarize our regression results. A glance at the statistics of the Table I will show that the managerial rewards (the executive wage plus bonus) insignificantly affect the investment, which is inconsistent with our theoretical anticipation.

TABLE II Effects of Executive Rewards on Investment Decision

Dependent : Growth Rate of Investment

	Pooling	Between	Within	Variance Components
Executive wage	5.67753	2.87196	5.43729	5.42277
	(3.32015)	(1.07202)	(2.85949)	(3.23635)
Growth Rate of Profits	.265016E-02	.447198	−.101787	−.049511
	(.049482)	(4.08454)	(−1.74732)	(−.948330)
adjusted R^2	.231735E-02	.019931	.106220	.057659

NOTE : NOB=13122, Figures in parentheses denote t-value.

TABLE III Effects of Executive Rewards on Investment Decision

Dependent : Growth Rate of Investment

	Pooling	Between	Within	Variance Components
Executive bonus	.346846	.335078	.347587	.345261
	(1.80049)	(.429557)	(1.71664)	(1.79972)
Growth Rate of Profits	.012121	−.768418E-02	.012227	.011833
	(.666377)	(−.167622)	(.605004)	(.651996)
adjusted R^2	.301430E-02	.019355	.150328	.027399

NOTE : NOB=14360, Figures in parentheses denote t-value.

However, Table II and III, which show how each executive wage and bonus affects the investment, suggest that the conclusion requires more details. They indicate that the effects of the executive salary and bonus upon the investment are totally separate from each other. The executive wage affects the investment, positively and significantly, while the effects of the executive bonus are insignificant.

IV. Concluding Remarks

Main message of this note is that the executive salaries of Japanese listed companies were related positively to the investment, but the executive bonuses were related insignificantly.

Our results imply the interesting story about investment decision of Japanese firms. That is, Japanese managers are personally motivated to investment highly on a daily business. However, they will have to pay penalty with their bonuses, if the investment is too high to cause low cash flow that stockholders can not bear, because the bonuses are approved in general meeting of stockholders.

This seems to be a very skillful mechanism for shareholders' benefits to accord with firm growth. We may call it as carrot-and-stick policy built in Japanese firms to bring about high-investment.

Of course, there are many points that require careful consideration, to sustain our conjecture. Especially, it is unclear why executive salaries were allowed to related to the investment. And empirically, their causal relation is highly ambiguous. Anyway, the results of this note call for

more intensive research.

NOTE

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