Crowding out and Efficacy of Fiscal Policy in Korea*

Kye-Sik Lee
Korea Development Institute

A modest attempt has been made to analyze the efficacy of fiscal policy in Korea by investigating the degree of crowding out or crowding in within the context of a household optimization model and through the estimation of household consumption and saving functions with the data set over the period 1963-86.

Fiscal policy in Korea has been a powerfully effective instrument for economic stabilization, to the extent that government spending in Korea, whether debt-or tax-financed, has crowded in rather than crowded out household consumption. This result contrasts with the notion of fiscal policy-ineffectiveness posited by the ultrarationality and perfect foreknowledge hypotheses. Furthermore, government and corporate saving turn out to be complements to rather than substitutes for household saving, which indicates that government and corporate saving can be effective policy variables for national capital formation.

I. Introduction

Over the last two decades, the efficacy of fiscal policy as an instrument for economic stabilization has been the subject of heated debate. Much research has been undertaken to investigate if government spending, whether debt- or tax-financed, has a permanent effect on real output, or if it merely crowds out private spending. Fromm and Klein (1973) and Batten and Hafer (1983), in particular, present empirical evidence for countries, such as the United States, Japan, Canada, and West Germany, which supports crowding out

*Part of this paper was presented at the International Institute of Public Finance (IIPF) 1988 Congress held in Istanbul during August 22-25. Gratefully acknowledged are helpful comments and suggestions from seminar participants at the IIPF Congress, Drs. Sung-Hee Jwa and Sang-Dal Shim of KDI, and Mr. Stephen B. Schwartz. I am also indebted to Chul-Soo Shin and Jin-Ho Jeong for their most capable research assistance. Remaining errors are solely mine.
[Seoul Journal of Economics 1988, Vol. 1, No. 4]

effect, and thus ineffectiveness of fiscal policy.

The principal aim of the present study is to analyze the efficacy of fiscal policy in Korea by examining the degree of crowding out or crowding in within the context of a household optimization model and through the estimation of household consumption and saving functions. The study comprises six sections. Section II briefly summarizes the issues involved on the effectiveness of fiscal policy. The empirical model and various hypotheses are presented in Section III. Section IV then discusses the empirical results of previous studies. Section V, in turn, analyzes the regression results obtained and the F-test result for the various alternative hypotheses, and further provides an international comparison of estimation results on household consumption and saving functions. Finally, Section VI concludes the paper.

II. The Issues Involved

The effectiveness, or efficacy, of fiscal policy as a stabilization instrument hinges on the degree of crowding out caused by fiscal expansion. Crowding out, in a broad sense, refers to the displacement of private economic activity by public economic activity. More specifically, crowding out refers to the phenomenon of government investment, borrowing, consumption, and saving displacing their private counterparts.

Crowding out effects are classified as either ex-post (or indirect) or ex-ante (or direct). Ex-post crowding out refers to the case where government activity displaces private activity indirectly through the price level and the interest rate. Ex-ante crowding out, on the other hand, refers to the case where government activity replaces private activity directly without affecting the price level or the interest rate. If crowding out is complete,[1] government activity perfectly displaces private activity and fiscal policy does not have any real effect on national aggregate economic variables. Compensatory fiscal policy, in particular, which aims to stabilize the economy by adjusting the inflationary or deflationary gaps cannot influence

[1]Crowding out is not, of course, an all-or-nothing phenomenon. Crowding out is referred to as complete/partial according as

$$|\Delta G| = |\Delta Z| \;/\; |\Delta G| > |\Delta Z|$$

where ΔG: increased government spending, for instance, and
ΔZ: decreased private spending.

national income. This is referred to as the (fiscal) policy-ineffectiveness hypothesis.

The subject of crowding out effectiveness of fiscal policy has a long history of debate in macroeconomic theory and policy. Crowding out is a multidimensional concept,[2] but here we focus on the effect of fiscal policy on consumer behavior: how government activity affects household consumption and saving. With respect to fiscal policy and consumer behavior, we may take up three crucial hypotheses. The first is the Keynesian hypothesis. The Keynesian consumption function simply relates consumption to disposable income. Fiscal policy, therefore, does not affect household consumption or saving directly, but indirectly through changes in disposable income. The Keynesian formulation lacks direct substitutability both between household and government consumption and between household and government saving.

Two major arguments have been put forward against the Keynesian view. One is the ultrarationality hypothesis proposed by David and Scadding (1974); the other is the perfect foreknowledge hypothesis posited by Bailey (1971, 1972). David and Scadding motivate their argument by the observation that the "Denison's Law (1958)"[3] applies to the private saving rate for the period 1898–1969. They argue that the household sector is ultrarational and pierces through the corporate veil, by incorporating decisions made in the corporate sector into its own consumption-saving decisions and further affects the corporate sector's decision on a one-to-one basis. Thus household and corporate saving are perfect substitutes. Another crucial implication of the ultrarationality hypothesis is that household and government consumption also trade off one to one.[4]

Bailey goes one step beyond the ultrarationality hypothesis and postulates that the household sector has perfect knowledge and perfect foresight (i.e. perfect foreknowledge), and that it pierces through even the government veil as well as the corporate veil. The

[2]In macroeconomics, the crowding-out phenomenon is usually analyzed within IS-LM models. A detailed discussion of these models is contained in Cebula (1987).

[3]The law refers to the observation that the private saving rate, including household and corporate saving, was almost constant in the United States from 1948 to 1956.

[4]This will be shown in the next section. The issue of perfect substitutability between household and corporate saving is related to the problem of raison d'etre of the classical corporate tax system which favors corporate saving vis-a-vis dividend. If household and corporate saving are close substitutes, the classical tax system has little effect on the national capital formation, and the integration of corporate and personal income tax system will be called for.

household sector, therefore, offsets any change in the corporate or government sectors' decision on a one-to-one basis. As a consequence, we observe perfect substitutability between household and government consumption, between household and corporate saving, and further between household and government saving.

III. The Model and Hypotheses

A model of household choice that incorporates different degrees of substitutability between household and corporate or government decisions can be specified as follows[5]:

$$\max_{C,S^H} \quad U = U(C, S^H; S^C, S^G, T) \tag{1}$$

$$\text{subject to } C + S^H + S^C + T = Y, \tag{2}$$

where C : household consumption, S^H : household saving, S^C : corporate saving, S^G: government saving, T : tax revenue,[6] and Y : gross national product (GNP).[7]

In this framework, C and S^H are endogenous variables and S^C, S^G, T, and Y are exogenous variables; the efficacy of fiscal policy can be analyzed by examining how these exogenous variables affect C and S^H.

The first-order conditions for the above utility maximization yield the following household consumption and saving functions:

$$C = C(S^C, S^G, T, Y),$$
$$S^H = S^H(S^C, S^G, T, Y).$$

By linearizing these equations, we have:

$$C = \alpha_1 + \alpha_2 S^C + \alpha_3 S^G + \alpha_4 T + \alpha_5 Y, \tag{3}$$
$$S^H = \beta_1 + \alpha_2 S^C + \beta_3 S^G + \beta_4 T + \beta_5 Y, \tag{4}$$

Further, the α's and β's are restricted as follows since equations (3) and (4) must satisfy the budget constraint (2) above:

[5]A large part of this section draws on Miller (1982) and Demopoulos et al. (1986).

[6]This variable is used here as a proxy for government consumption.

[7]The above optimization problem is basically identical to the usual intertemporal maximization process with the utility function

$$U = U(C_1, C_2)$$

if the interest rate and the second period's income are constant.

$$\alpha_1 + \beta_1 = 0, \quad \alpha_2 + \beta_2 = -1, \quad \alpha_3 + \beta_3 = 0,$$
$$\alpha_4 + \beta_4 = -1, \quad \alpha_5 + \beta_5 = 1. \tag{5}$$

The basic model (3) and (4) permits different degrees of substitutability between household, corporate, and government saving, as well as between household and government consumption. The Keynesian, ultrarationality and perfect foreknowledge hypotheses discussed in the previous section turn out to be special cases of the above basic model, and we now examine the conditions required by each of the three hypotheses.

A. Keynesian Hypothesis

The standard Keynesian model assumes that the household sector makes its consumption-saving decisions independent of corporate and government decisions. Accordingly exogenous variables, S^C, S^G, T, do not have any impact on household utility, and the household choice problem can be described as follows:

$$\max_{C,S^H} U = U(C, S^H)$$
$$\text{subject to } C + S^H = Y - S^C - T = DI,$$

where DI stands for disposable income.

We then obtain the following consumption and saving functions:

$$C = a_1 + a_2(Y - S^C - T),$$
$$S^H = -a_1 + (1 - a_2)(Y - S^C - T).$$

These equations are special cases of the basic model (3) and (4) and a comparison between the four equations yields the following conditions under the Keynesian hypothesis:

$$\alpha_2 + \alpha_5 = 0, \quad \alpha_3 = 0, \quad \alpha_4 + \alpha_5 = 0;$$
$$\beta_2 + \beta_5 = 0, \quad \beta_3 = 0, \quad \beta_4 + \beta_5 = 0. \tag{6}$$

B. Ultrarationality Hypothesis

According to this hypothesis, we have a constant private saving rate since household and corporate saving are perfect substitutes. The private saving rate (s) is expressed as follows from the budget constraint (2):

$$s = (S^H + S^C)/Y = 1 - (C + T)/Y.$$

If s is a constant, then $(C + T)/Y$ must also be a constant. This implies that household consumption and tax revenue, a proxy for government consumption, are perfect substitutes and the household sector regards, in its consumption-saving decision, the sum of S^H and S^C as well as C and T as a unit of choice variables.

The household optimization problem, therefore, can be summarized as follows:

$$\max_{C+T, S^H+S^C} U = U(C + T, S^H + S^C)$$
$$\text{subject to } (C + T) + (S^H + S^C) = Y.$$

We then obtain the following consumption and saving functions:

$$C + T = b_1 + b_2 Y,$$
$$S^H + S^C = -b_1 + (1 - b_2) Y.$$

These equations are also special cases of the basic model (3) and (4) above and a comparison of the four equations renders the following conditions under the ultrarationality hypothesis:

$$\begin{aligned} \alpha_2 &= 0, \quad \alpha_3 = 0, \quad \alpha_4 = -1; \\ \beta_2 &= -1, \quad \beta_3 = 0, \quad \beta_4 = 0. \end{aligned} \tag{7}$$

C. Perfect Foreknowledge Hypothesis

The household sector is, under this hypothesis, presumed to see not only through the corporate veil but also through the government veil. It then follows that the household, corporate and government saving as well as household consumption and tax revenue are perfect substitutes.[8] This in turn indicates that the household sector considers, in its utility maximization, the sum of S^H, S^C, S^G as well as C and T as a unit of choice variables.

The household choice problem is thus described as follows:

$$\max_{C+T, S^H+S^C+S^G} U = U(C + T, S^H + S^C + S^G)$$
$$\text{subject to } (C + T) + (S^H + S^C + S^G) = Y + S^G.$$

We then have the following consumption and saving functions:

$$C + T = c_1 + c_2(Y + S^G)$$
$$S^H + S^C + S^G = -c_1 + (1 - c_2)(Y + S^G).$$

[8]Demopoulos et al. (1986) negates the hypothesis of substitutability between household and government consumption; it is incorrect, however, in light of the perfect foresight hypothesis under which the household sector has perfect knowledge about the corporate and government sectors.

TABLE 1
CONDITIONS UNDER DIFFERENT SUBSTITUTABILITY HYPOTHESES[1]

	S^H and S^C	S^H and S^G	C and C^G
No Substitutability	$\alpha_2 + \alpha_5 = 0$ $\beta_2 + \beta_5 = 0$	$\alpha_3 = \beta_3 = 0$	$\alpha_4 + \alpha_5 = 0$ $\beta_4 + \beta_5 = 0$
Perfect Substitutability	$\alpha_2 = 0$ $\beta_2 = -1$	$\alpha_3 - \alpha_5 = 0$ $\beta_3 - \beta_5 = -1$	$\alpha_4 = -1$ $\beta_4 = 0$

Note: 1. For C^G tax revenue is used here instead as a proxy variable.

These equations are also special cases of the basic model (3) and (4), and a comparison between the four equations gives the following parameter restrictions under the perfect foreknowledge hypothesis[9]:

$$\begin{aligned} \alpha_2 &= 0, \quad \alpha_3 - \alpha_5 = 0, \quad \alpha_4 = -1; \\ \beta_2 &= -1, \quad \beta_3 - \beta_5 = -1, \quad \beta_4 = 0. \end{aligned} \tag{8}$$

The three composite sets of conditions (6)~(8) can be further separated into six distinct sets of conditions according to no or perfect substitutability between household and corporate saving, between household and government saving, and finally between household and government consumption (C^G); these are summarized in Table 1.[10]

IV. Previous Empirical Studies

The issue of crowding out and effectiveness of fiscal policy has given rise to a substantial body of empirical analysis. Table 2 facilitates a comparison of some of these analyses with respect to countries and periods analyzed, dependent and explanatory variables, and the conclusions drawn regarding substitutability between the variables concerned. In the table, a total of nine studies are summarized; they fall broadly into two categories. One group examines the Keynesian or ultrarationality hypothesis and focuses on the substitutability between household and corporate saving; the second group, on the other hand, analyzes the Keynesian, ultrarationality and perfect foreknowledge hypotheses in conjunction with substitutability between household, corporate and government saving, as

[9]These are different from the conditions (7) under the ultrarationality hypothesis in that household and government saving are perfect substitutes, i.e., $\alpha_3 - \alpha_5 = 0$, and $\beta_3 - \beta_5 = -1$.

[10]We are able to derive the six distinct conditions by the comparative static analysis of the household choice problem (1) and (2).

TABLE 2

COMPARISON OF PREVIOUS WORKS

Author	Country	Period	Dependent Variables[1]	Explanatory Variables[1]	Conclusions
Feldstein (1973)	U.S.A.	1929-66 (except for 1942-47)	C	$HDI, HDI(-1), W(-1)$ U, G, GSB(or NSB)	SH and GSB: close substitutes
Feldstein-Fane (1973)	U.K.	1948-69	C	$HDI, W(-1)$, NSB, G, RE	SH and GSB: close substitutes
Bhatia (1979)	U.S.A.	1948-74	C	$HDI, W(-1)$, G, NSB	SH and NSB: no substitutes
Auerbach (1982)	U.S.A.	1960 II-82 I	C	$HDI, C(-1)$, W, NSB, U	SH and NSB: no substitutes
Koskela-Virén (1984)	OECD (13 Countries)	1963-80	C	Y_l, Y_e, Y_p, Y_r, Y_x, Y_s, $C(-1), NSB, U$	SH and NSB: close substitutes
Pitelis (1987)	U.K.	1951-83	GSP	$HDI, GSP(-1)$, GSB, $GSB(-1)$	SH and NSB: no substitutes
Miller (1982)	U.S.A.	1948-78	C, GSH	GSB, GSG, T, GNP	i) SH and GSB, C and GC: close substitutes[2] ii) SH and GSG: no substitutes
Koskela-Virén (1986)	OECD (12 Countries)	1961-80	C	HDI, NSB, NSG, U, $C(-1)$	i) SH and NSB: close substitutes ii) SH and NSG: no substitutes
Demopoulos et al. (1986)	OECD (16 Countries)	1961-81[3]	C, NSH	NSB, NSG, NT, NDI	i) Ultrarationality and Perfect Foreknowledge Hypotheses: all rejected ii) Keynesian Hypothesis: supported only for U.S.A. Austria, Finland iii) SH and NSB: perfect substitutes for Austria, Belgium, Greece, Netherlands

Note: 1. C: Private Final Consumption Expenditures, GSP: Gross Private Saving, GSH: Gross Household Saving, NSH: Net Household Saving, HDI: Private Disposable Income, NDI: National Disposable Income, GNP: Gross National Product, SH: Household Saving, GSB: Gross Business Saving, NSB: Net Business Saving, NSG: Net General Government Saving, GSG: Gross Government Saving, W: Wealth, G: Capital Gain, U: Unemployment Rate, GC: General Government Final Consumption Expenditures, T: Total Tax, NT: Net Tax, RE: Retained Earnings, Y_l: Labor Income, Y_e: Entrepreneurial Income, Y_p: Property Income, Y_r: Transfer Income, Y_x: Tax Expenditure, Y_s: Personal Contributions to Social Security.

2. No substitutes, when consumer durables expenditures are accounted as household saving.

3. Different periods are covered across countries.

well as between household and government consumption.

Feldstein (1973), Feldstein and Fane (1973), Bhatia (1979), Auerbach (1982), Koskela and Virén (1984), and Pitelis (1987) belong to the first group. Feldstein, as well as Feldstein and Fane, estimate consumption functions for the United States and the United Kingdom; they obtain the results that conform to the ultrarationality hypothesis, in that household and corporate saving are close, though not perfect, substitutes. Based on their findings, they advocate integrating the corporate and personal income tax systems, claiming that the classical separate-entity corporate tax, which provides a strong incentive for corporate saving rather than dividend, appears to have little, if any, effect on national capital formation as a whole.

Bhatia, on the other hand, presents evidence supportive of the Keynesian hypothesis. By estimating a consumption function for the United States, he finds that corporate saving has no independent impact on household saving. He further asserts that a switch from a classical to an integrated tax system is likely to lead to some decline in aggregate capital formation. Auerbach also obtains results akin to Bhatia's by estimating Feldstein's consumption function with more current quarterly data, for 1966 II–1982 I. Koskela and Virén estimate a consumption function using pooled data for 13 OECD countries over the period 1963–80. Their results are in line with the ultrarationality hypothesis in that household and corporate saving are found to be close substitutes. Pitelis, however, by estimating a private saving function for the United Kingdom, presents contrasting results that are close to the Keynesian hypothesis. He asserts that corporate saving should be excluded as an explanatory variable from the household consumption and saving functions.

Koskela and Virén (1986), Miller (1982), and Demopoulos et al. (1986) belong to the second group of studies that explore the three composite hypotheses together. Koskela and Virén analyze substitutability between household, corporate and government saving using pooled data for 12 OECD countries over the period 1961–80. Their conclusions support the ultrarationality hypothesis in that household and corporate saving are found to be close substitutes but government saving has no crowding out effect on household saving. Miller and Demopoulos et al. estimate consumption and saving functions like (3) and (4) discussed in the previous section and carry out tests on the three composite hypotheses concerning substitutability between the three sectors' saving and the efficacy of fiscal policy.

Miller estimates the two equations using 1948–78 data for the

United States, and draws different conclusions depending on whether consumer durables expenditures are included in or excluded from household saving.[11] When consumer durables expenditures are treated as consumption rather than as saving, his results are supportive of the ultrarationality hypothesis, in that household and corporate saving, as well as household and government consumption, are observed to be close substitutes; household and government saving, however, do not show any substitutability. On the other hand, when consumer durables expenditures are treated as saving, his results support the Keynesian hypothesis of no substitutability between the three sectors' saving and between household and government consumption. Finally, Demopoulos et al. estimate consumption and saving functions for 16 OECD countries over the 1960s and 70s. They report that, while the ultrarationality and perfect foreknowledge hypotheses are rejected for all the countries analyzed, the Keynesian hypothesis is validated only for the United States, Austria and Finland.

V. Estimation Results

The data set used in this paper covers the period 1963–86. Tables 3 through 6 present the estimation results of Korean consumption and saving functions (3) and (4). F–test results are also included for the various hypotheses about substitutability between the three sectors' saving and the efficacy of fiscal policy. Two data sets are used: one, whose results are reported in Tables 3 and 4, uses national disposable income (*NDI*); the other uses gross national income (*GNP*), and its results are reported in Tables 5 and 6. Variables associated with Tables 3 and 4 are defined as follows: Y: *NDI*, C: private final consumption expenditures, S^N: net household saving, S^C: net corporate saving, S^G: net saving of general government, T: net tax revenue, W: financial net assets of the private sector, C': C minus consumer durables expenditures, and $S^{H'}$: S^H plus consumer durables expenditures.[12]

Equation 1 of Table 3 presents results from the basic specifica-

[11]For a discussion of this issue, see, in particular, Auerbach (1985).

[12]Data used in the present study was obtained from various publications of the Bank of Korea and Bureau of Statistics, Economic Planning Board. All data are expressed in per capita terms and are deflated by the consumer price index. Further, all regression results are obtained by the method of ordinary least squares (*OLS*).

TABLE 3
ESTIMATES OF CONSUMPTION AND SAVING FUNCTIONS (*NDI* MODEL)

Equation	Dependent Variables	Constant	S^C	S^G	T	Y	W_{-1}	R^2	*D.W.*
1	C	0.005	−1.775	−1.055	0.288	0.715		0.9982	1.850
		(4.420)**	(−6.391)**	(−2.821)**	(0.574)	(8.855)**			
	S^H	−0.005	0.775	1.055	−1.288	0.285		0.9727	1.850
		(−4.420)**	(2.790)**	(2.821)**	(−2.566)**	(3.531)**			
2	C	0.008	−1.732	−1.104	0.558	0.543	0.228	0.9988	2.017
		(6.420)**	(−7.568)**	(−3.636)**	(1.346)**	(6.611)**	(3.213)**		
	S^H	−0.008	0.732	1.104	−1.558	0.457	−0.228	0.9821	2.017
		(−6.420)**	(3.198)**	(3.636)**	(−3.758)**	(5.558)**	(−3.213)**		
3	C'	0.006	−1.658	−1.198	0.556	0.637		0.9959	1.602
		(3.701)**	(−4.912)**	(−2.696)**	(0.928)**	(6.200)**			
	$S^{H'}$	−0.006	0.658	1.198	−1.556	0.363		0.9703	1.602
		(3.701)**	(1.950)**	(2.696)**	(−2.594)**	(3.537)**			
4	C'	0.008	−1.759	−1.274	0.607	0.523	0.225	0.9968	1.871
		(4.100)**	(−6.055)**	(−3.320)**	(1.200)	(5.048)**	(2.717)**		
	$S^{H'}$	−0.008	0.759	1.274	−1.607	0.477	−0.225	0.9781	1.871
		(−4.100)**	(2.613)**	(3.320)**	(−3.176)**	(4.599)**	(−2.717)**		

Note: The figures in parentheses are *t*-values.
* significant at $\alpha \leq 0.10$
** significant at $\alpha \leq 0.05$

tion of the consumption and saving functions. The coefficient associated with corporate saving is negative in the consumption function but positive in the saving function. This indicates that household and corporate saving are complements rather than substitutes, which is in sharp contrast to results obtained for other countries, as will be discussed later in this section.

The coefficients associated with government saving (i.e., α_3 and β_3) measure the impact of debt-financed government expenditure on household consumption and saving. This follows because we have $S^G = T - G$ (G: government spending), and a decrease (increase) in government saving holding net taxes constant causes a debt-financed increase (decrease) in government expenditure. From the table, we see that $\alpha_3 < 0$ and $\beta_3 > 0$; this implies that debt-financed government expenditure and household consumption are complements rather than substitutes and further that deficit spending crowds in rather than crowds out household consumption.

The coefficients on net taxes (i.e., α_4 and β_4) measure the effect of tax-financed government expenditure on household consumption and saving. This follows, as before, from the definition of government spending; $S^G = T - G$. An increase (decrease) in net taxes holding government saving constant brings about a tax-financed increase (decrease) in government expenditure. The estimate of α_4 is not significantly different from zero but $\beta_4 < 0$. This implies that tax-financed expenditure has no significant effect on private consumption, but it does have a negative effect on household saving.

Equations 2 through 4 of Table 3 are variants of equation 1. Equation 2 incorporates wealth effects into household consumption-saving decisions, while equation 3 treats consumer durables expenditures as household saving rather than as consumption. Equation 4 is obtained by adding the wealth effect to equation 3. A comparison of the estimates from each of these three equations with those of equation 1 reveals a similarity in terms of the sign and significance of estimated coefficients, but drastic differences in the magnitudes of the coefficients in several cases.[13] In equations 2 and 4, household wealth is shown to exert a significant impact on household consumption and saving.

F-test results obtained from the estimates in Table 3 are reported in Table 4. Hypotheses of perfect substitutability between

[13]In particular, the coefficients on net taxes and *NDI* show a substantial variation across the equations.

TABLE 4
F-TEST RESULTS (*NDI* MODEL)

Equation	S^H and S^C: No Substitutes	S^H and S^G: Perfect Substitutes	C and C^G: No Substitutes	Keynesian	Ultra-rationality	Perfect Foreknowledge
1	21.070**	30.527**	5.607**	16.292**	38.222**	48.591**
2	36.517**	39.104**	10.130**	27.439**	59.485**	71.199**
3	14.061**	21.634**	5.630**	11.349**	26.297**	28.734**
4	24.492**	25.015**	7.241**	18.681**	40.474**	41.753**

Note: **significant at $\alpha \leq 0.05$

household and corporate saving (i.e., $\alpha_2 = 0$, $\beta_2 = -1$), no substitutability between household and government saving (i.e., $\alpha_3 = \beta_3 = 0$), and perfect substitutability between household and government consumption (i.e., $\alpha_4 = -1$, $\beta_4 = 0$) are all rejected at 5% significance level. The three remaining hypotheses and all three composite hypotheses - namely, the Keynesian, ultrarationality and perfect foreknowledge hypotheses - are also rejected. These results are not very surprising, given our observations in Table 3; household and corporate saving, as well as debt-financed government expenditure and household consumption, turn out to be complements rather than substitutes.

Table 5 presents estimation results of consumption and saving functions from the *GNP* data set. The variables in Table 5 are defined as follows: Y: *GNP*, S^H: gross household saving, S^C: gross corporate saving, S^G: gross government saving, T: gross tax revenue and $S^{H'}$: S^H plus consumer durables expenditures.[14] The most notable difference between the results of Tables 3 and 5 is that the coefficient on the tax variable in the consumption function now turns out to be significant, and greater than one in all of the equations. This indicates that tax-financed government expenditure and household consumption are complements rather than substitutes and that tax-financed government expenditure also crowds in rather than crowds out household consumption.

Equations 6 through 8 are variants of equation 5, analogous to equations 2 through 4 for equation 1 in Table 3. Comparing estimates of equations 6 through 8 to those of equaton 5, we observe rather drastic variations in significance levels and magnitudes of the estimated coefficients. The most telling difference is found in equa-

[14]The variables W, C and C' are the same as those in Table 3.

TABLE 5

ESTIMATES OF CONSUMPTION AND SAVING FUNCTIONS (*GNP* MODEL)

Equation	Dependent Variables	Constant	S^C	S^G	T	Y	W_{-1}	R^2	*D.W.*
5	C	0.006	−1.513	−1.047	1.114	0.578		0.9976	1.195
		(5.021)**	(−6.021)**	(−2.310)**	(2.563)**	(7.215)**			
	S^{II}	−0.006	0.513	1.047	−2.114	0.422		0.9555	1.195
		(−5.021)**	(2.043)*	(2.310)**	(−4.863)**	(5.261)**			
6	C	0.008	−1.726	−0.658	1.076	0.413	0.351	0.9988	1.970
		(8.542)**	(−8.651)**	(−1.849)*	(3.350)**	(6.255)**	(4.202)**		
	S^{II}	−0.008	0.726	0.658	−2.076	0.587	−0.351	0.9783	1.970
		(−8.542)**	(3.638)**	(1.849)*	(−6.464)**	(8.877)**	(−4.202)**		
7	C'	0.008	−1.322	−1.138	1.427	0.460		0.9948	1.136
		(4.124)**	(−4.259)**	(−2.094)*	(2.848)	(4.465)**			
	$S^{II'}$	−0.008	0.322	1.138	−2.427	0.540		0.9531	1.136
		(−4.124)**	(1.037)	(2.094)*	(−4.843)**	(5.248)**			
8	C'	0.010	−1.622	−0.590	1.206	0.343	0.330	0.9968	1.879
		(5.596)**	(−6.410)**	(−1.308)	(3.969)**	(3.969)**	(3.385)**		
	$S^{II'}$	−0.010	0.622	0.590	−2.206	0.657	−0.330	0.9720	1.879
		(−5.596)**	(2.458)**	(1.308)	(−5.819)**	(7.597)**	(−3.385)**		

Note: The figures in parentheses are *t*-values.

*significant at $\alpha \leq 0.10$

**singificant at $\alpha \leq 0.05$

TABLE 6
F-TEST RESULTS (*GNP* MODEL)

Equation	S^H and S^C: No Substitutes	S^H and S^G: Perfect Substitutes	C and C^G: No Substitutes	Keynesian	Ultra-rationality	Perfect Foreknowledge
5	19.165**	16.315**	22.056**	14.811**	33.519**	38.215**
6	49.383**	10.326**	29.477**	36.185**	74.021**	80.631**
7	11.741**	10.376**	21.187**	13.213**	26.857**	27.341**
8	32.098**	4.486*	23.417**	26.887**	51.996**	50.864**

Note: *significant at $\alpha \leq 0.10$
**significant at $\alpha \leq 0.05$

tions 7 and 8: the coefficient on corporate saving in the household saving function turns out to be insignificant in equation 7, while the coefficient on government saving is also insignificant in equation 8. These results support the hypothesis of no substitutability between household and government saving.[15]

The *F*-test statistics for the estimates in Table 5 are reported in Table 6. Of the six distinct hypotheses summarized in Table 1, the hypotheses of perfect substitutability between household and corporate saving, perfect substitutability between household and government consumption, and no substitutability between household and government saving are rejected by the estimates reported in Table 5, except for the case where the hypothesis of no substitutability between household and government saving is supported. In Table 6, the remaining three distinct hypotheses and all three composite hypotheses are rejected altogether. These results are in line with those reported in Table 5; that tax-financed government expenditure and household consumption, in addition to household and corporate saving as well as debt-financed government expenditure and household consumption are complements rather than substitutes.

Table 7 provides a comparison of estimation results of household consumption and saving functions (3) and (4) for eight countries inclusive of Korea.[16] The results for Japan, the United States, the United Kingdom, West Germany, France and Canada are quoted from Demopoulos et al. (1986). Taiwan's consumption and saving

[15]The *NDI* model of Table 3 appears to be more stable than the *GNP* model of Table 5 in that significance levels and magnitudes of the coefficients and Durbin-Watson statistics do not vary substantially across the equations.

[16]The international comparison below is based on regression results of the *NDI* model.

TABLE 7
INTERNATIONAL COMPARISON OF REGRESSION RESULTS

Country	Dependent Variable	Constant	S^C	S^G	T	Y	R^2	$D.W.$	Period
Japan	C	0.11	0.414	-3.419	3.324	0.194	0.997	1.58	1965-81
		(6.14)**	(1.89)*	(-4.17)**	(3.10)**	(1.34)			
	S^H	-0.11	-1.414	3.419	-4.324	0.806	0.980	1.58	
		(-6.14)**	(-6.45)**	(4.17)**	(-4.04)**	(5.59)**			
U.S.A.	C	-0.19	-0.641	-0.219	0.429	0.845	0.979	1.85	1964-81
		(-0.95)	(-2.53)**	(-0.69)	(-1.02)	(9.38)**			
	S^H	0.19	-0.359	0.219	-0.571	0.155	0.972	1.85	
		(0.95)	(-1.42)	(0.69)	(-1.36)	(1.72)*			
U.K.	C	0.16	-0.415	-0.083	-0.288	0.666	0.995	1.59	1961-81
		(5.96)**	(-3.54)**	(-0.74)	(-1.65)	(12.43)**			
	S^H	-0.16	-0.585	0.083	-0.712	0.334	0.943	1.59	
		(-5.96)**	(-4.98)**	(0.74)	(-4.08)**	(6.22)**			
Germany	C	0.53	-0.460	-0.279	-0.284	0.692	0.985	1.19	1961-81
		(1.80)*	(-2.56)**	(-1.42)	(-1.06)	(9.36)**			
	S^H	-0.53	-0.540	0.279	-0.716	0.308	0.622	1.19	
		(-1.80)*	(-3.01)**	(1.42)	(-2.68)**	(4.17)**			
France	C	0.51	-0.318	-1.610	1.675	0.347	0.999	1.45	1961-81
		(5.05)**	(-2.63)**	(-7.36)**	(5.91)**	(7.64)**			
	S^H	-0.51	-0.682	1.610	-2.675	0.603	0.976	1.45	
		(-5.05)**	(-5.64)**	(7.36)**	(-9.43)**	(11.61)**			
Canada	C	0.51	-0.403	-0.587	0.069	0.546	0.999	1.71	1961-81
		(9.73)**	(-2.50)**	(-4.18)**	(0.42)	(10.08)**			
	S^H	-0.51	-0.597	0.587	-1.069	0.454	0.985	1.71	
		(-9.73)**	(-3.69)**	(4.18)**	(-6.48)**	(8.37)**			
Taiwan	C	0.045	-0.846	-0.439	0.523	0.520	0.998	1.77	1964-85
		(8.721)**	(-4.075)**	(-2.763)**	(2.012)*	(10.754)**			
	S^H	-0.045	-0.154	0.439	-1.523	0.480	0.981	1.77	
		(-8.721)**	(-0.742)	(2.763)**	(-5.856)**	(9.916)**			
Korea	C	0.005	-1.775	-1.055	0.288	0.715	0.998	1.85	1963-86
		(4.420)**	(-6.391)**	(-2.821)**	(0.574)	(8.855)**			
	S^H	-0.005	0.775	1.055	-1.288	0.285	0.973	1.85	
		(-4.420)**	(2.790)**	(2.821)**	(-2.566)**	(3.531)**			

Note: The figures in parentheses are t-values.
*significant at $\alpha \leq 0.10$
**significant at $\alpha < 0.05$

functions are newly estimated here from a data set over the period 1964–85; the estimation results for Korea are reproduced from equation 1 of Table 3. The coefficients on corporate saving for Korea and Japan are quite distinguishable from those of the other five countries, where we observe $-1 < \alpha_2 < 0$, and $-1 < \beta_2 < 0$,[17] which implies that household and corporate saving are imperfect substitutes. For Japan, however, we observe $\alpha_2 > 0$ and $\beta_2 < -1$; this indicates that a one unit increase in corporate saving is offset by an even larger unit decrease in household saving. For Korea, in particular, we observe a rather surprising result that $\alpha_2 < -1$ and $0 < \beta_2 < 1$, which implies that household and corporate saving are complements rather than substitutes.[18]

The coefficients associated with government saving, which measure the impact of debt-financed government expenditure on household consumption and saving, is not significantly different from zero for three countries: the United States, the United Kingdom and West Germany. This provides support for the hypothesis of no substitutability between household and government saving. For the other five countries, we observe $\alpha_3 < 0$ and $\beta_3 > 0$; this implies that debt-financed government expenditure crowds in, rather than crowds out, household consumption. For Korea, Japan and France, a fortiori, we observe $\alpha_3 < -1$ and $\beta_3 > 1$: a one unit increase in debt-financed government expenditure thus results in a more than one unit increase (decrease) in household consumption (saving).

The coefficient on net taxes in the consumption function, which measures the effect of tax-financed government expenditure on household consumption, is positive for Japan, France and Taiwan.[19] For the other five countries, however, the coefficient is not significantly different from zero. Finally, the estimates for the coefficients of net taxes in the saving function are as follows: $\beta_4 < -1$ for Japan, France, Canada, Taiwan and Korea; $-1 < \beta_4 < 0$ for

[17]For the United States and Taiwan, however, β_2 is not significantly different from zero.

[18]We cannot offer a definitive answer as to why Korea shows such a stark contrast, at this time. The possibility is that Korea's capital market, inter alia, remains in its infancy, and that the household sector cannot pierce through the corporate veil, and therefore cannot incorporate corporate decisions into its own consumption-saving decisions. Poterba (1987) argues that substitutability or complementarity between household and corporate saving depends on the source of the change in corporate saving. He illustrates that if corporate saving increases because of an improvement in the productivity of corporate capital, the two sectors' saving then turn out to be complements rather than substitutes.

[19]We observe $\alpha_4 > 1$ for Japan and France, and $0 < \alpha_4 < 1$ for Taiwan.

the United Kingdom and West Germany; and $\beta_4 = 0$ for the United States. For Japan and France, in particular, the values of $\alpha_4 > 1$ and $\beta_4 < -1$ mean that a one unit increase in tax-financed government expenditures brings about a more than one unit increase (decrease) in household consumption (saving).[20]

VI. Conclusions

The major conclusions obtained from this study with respect to Korea can be summarized as follows:

(1) Six distinct hypotheses of perfect or no substitutability between household and corporate saving, between household and government saving, and between household and government consumption are all rejected. Also rejected are three composite hypotheses: the Keynesian, ultrarationality and perfect foreknowledge hypotheses.

(2) Debt- or tax-financed government expenditure and household consumption are complements rather than substitutes. This implies that government spending, whether debt- or tax-financed, does not crowd out but rather crowds in household consumption.

(3) Household and corporate saving are also complements. This is the most significant difference between the Korean case and those of other countries. Moreover, it is at odds with what is implied by the Keynesian, ultrarationality and perfect foreknowledge hypotheses.

The following implications for policy, in turn, follows from these conclusions.

First, government spending in Korea, whether debt- or tax-financed, has been a powerfully effective instrument for economic stabilization, to the extent that it has crowded in or augmented household consumption. From a long-run perspective, however, increases in government spending bring about decreases in household saving, which may eventually reduce private investment. Accordingly, effective policy measures that can vitalize private investment and deal

[20]For the six countries analyzed by Demopoulos et al., the above mentioned three composite hypotheses are mostly rejected by the F-test performed. One notable exception is the Keynesian hypothesis for the United States. For Taiwan, of the six distinctive and three composite hypotheses, only the hypothesis of no substitutability between household and corporate saving is supported.

with the problem of the long-run crowding out should be devised.

Second, since government saving turns out to be a complement to rather than a substitute for household saving,[21] it can be an effective policy variable for national capital formation, one of the vital policy goals in Korea. In order to promote government saving and ultimately national saving, therefore, a sound budget principle that can effectively control financial needs and enhance revenue capacity should be maintained.

Third, corporate saving also turns out to be a crucial policy variable for national capital formation, since household and corporate saving are complements. To increase or maintain a high national saving rate, fiscal policy measures, especially tax incentives to promote corporate saving, should be strengthened further. In this respect, Korea's present classical corporate tax system, which favors corporate saving relative to dividend, appears to play a positive role in national capital formation. Our results further imply that if Korea switches from the present system to an integrated corporate tax system, corporate as well as household saving is likely to decline to a considerable extent.

The aim of the present study was to measure the degree of substitutability or complementarity betwen private and public variables and thereby assess the efficacy of fiscal policy in Korea. This study, using a framework of a household optimization model and estimating household consumption and saving functions, has been able to generate rather meaningful and interesting results vis-a-vis other countries as well as previous studies. Nonetheless, the study remains incomplete, and a great deal of further research must be done for a more thorough assessment of the efficacy of fiscal policy in Korea.

References

Auerbach, A. J. "Issues in the Measurement and Determinants of Business Saving." NBER Working Paper, No. 1024 (1982).

_____. "Saving in the U. S.: Some Conceptual Issues." In P. H. Hendershott (ed.), *The Level and Composition of Household Saving.* Ballinger, 1985.

Bailey, M. J. *National Income and the Price Level: A Study in Macroeconomic*

[21]It follows from the fact that government spending crowds in household consumption and from the relatonship that $S^G = T - G$.

Theory. McGraw-Hill, 1971.

_____. "The Optimal Full-Employment Surplus." *Journal of Political Economy* 80 (1972) : 649-61.

Batten, D. S., and Hafer, R. W. "The Relative Impact of Monetary and Fiscal Actions on Economic Activity : A Cross-Country Comparison." *Federal Reserve Bank of St. Louis Review* 65 (1983) : 5-12.

Bhatia, K. B. "Corporate Taxation, Retained Earnings, and Capital Formation." *Journal of Public Economics* 11 (1979) : 123-34.

Cebula, R. J. *Federal Budget Deficits : An Economic Analysis.* Lexington, 1987.

David, P. A., and Scadding, J. L."Private Savings : Ultrarationality, Aggregation and 'Denison's Law'." *Journal of Political Economy* 82 (1974) : 225-49.

Demopoulos, G. D., Katsimbris, G. M., and Miller, S. M. "Ex-Ante Crowding Out? A Cross-Country Comparison of Direct-Substitutability Hypotheses." *Journal of Policy Modeling* 8 (1986) : 351-70.

Denison, E. F. "A Note on Private Saving." *Review of Economics and Statistics* 40 (1958) : 261-7.

Feldstein, M. S. "Tax Incentives, Corporate Saving, and Capital Accumulation in the United States." *Journal of Public Economics* 2 (1973) : 159-71.

Feldstein, M. S., and Fane, G. "Taxes, Corporate Dividend Policy and Personal Savings : The British Postwar Experience." *Review of Economics and Statistics* 55 (1973) : 399-411.

Fromm, G., and Klein, L. R. "A Comparison of Eleven Econometric Models of the United States." *American Economic Review* 63 (1973) : 385-93.

Koskela, E., and Virén, M. "Household Saving out of Different Types of Income Revisited." *Applied Economics* 16 (1984) : 379-96.

_____. "Testing the Direct Substitutability Hypotheses of Saving." *Applied Economics* 18 (1986) : 143-55.

Miller, S. M. "Crowding Out : A Test of Some Direct Substitutability Hypotheses." *Journal of Macroeconomics* 4 (1982) : 419-32.

Pitelis, C. N. "Corporate Retained Earnings and Personal Sector Saving : A Test of the Life-Cycle Hypotheses of Saving." *Applied Economics* 19 (1987): 907-13.

Poterba, J. M. "Tax Policy and Corporate Saving." *Brookings Papers on Economic Activity,* No. 2 (1987) : 455-515.