The Real Interest Rate, Foreign Capital and Domestic Saving: The Case of Korea
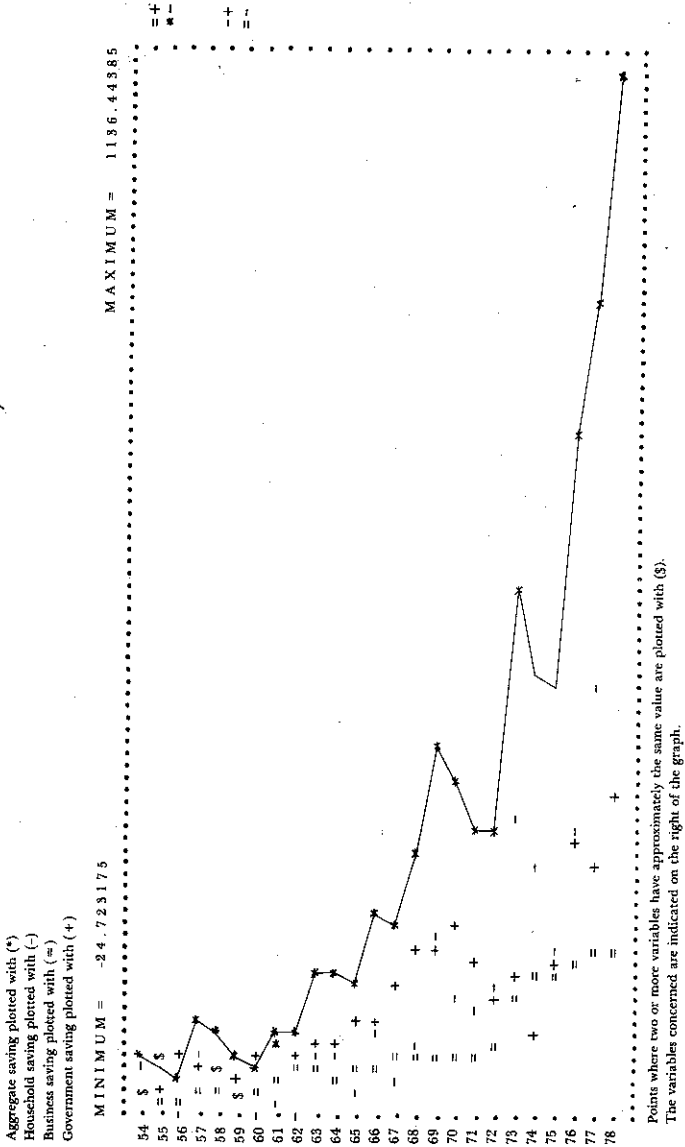
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Internal saving, to finance productive investment, is an indispensible ingredient in sustained economic growth. Yet much of the economic and political framework associated with high saving rates and rapid growth, or with low saving rates and stagnation, remains to be understood. Therefore, when domestic saving rises dramatically in a country--as it did in Korea in the mid 1960s (see Figure 1)--economists naturally look at the case more closely to see what can be learned. The Korean case is of special interest because it provides an opportunity to examine two of the important and indeed controversial topics in this area: the importance of the real interest rate and the effect of foreign capital on domestic saving behavior in less developed countries (LDCs). The former topic develops out of the influential work of E. Shaw (1973) and R. McKinnon (1973) who emphasize the importance to saving behavior of relaxing "financial repression." They argued that saving depends on the intermediation role of the financial system, and that since money--due to the lack of alternative financial instruments--is the predominant form of private saving in LDCs, increases in the real money stock (including time and savings deposits) are essential complements of private saving. To attract saving, thus, requires and increase in the real rate of return on money.

Professor Shaw, among others, helped design a series of financial reforms in Korea in the mid 1960s through a combination of policies to reduce the rate of inflation and to allow the nominal interest rate to rise, and much of the subsequent surge in saving is at-

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Figure 1

DOMESTIC SAVING TRENDS IN KOREA
(in billions of constant 1970 Wons)

Aggregate saving plotted with (*)
Household saving plotted with (−)
Business saving plotted with (=)
Government saving plotted with (+)

MINIMUM = −24.723175

MAXIMUM = 1186.44385

Points where two or more variables have approximately the same value are plotted with ($).
The variables concerned are indicated on the right of the graph.

tributed to the interest rate effects of the reform (see McKinnon, 1976 and Brown, 1973). However, a few observers, such as Hagen (1975), still view the reforms sceptically, concluding that "it is uncertain. . .that the high accumulation in South Korea and Taiwn resulted primarily or largely from their high interest rate." Williamson (1968) had claimed earlier that ". . .higher interest rates are associated, if anything, with lower real saving in Asia."[1] Frank, Kim and Westphal (1975) appear to confirm the importance of interest rate in saving in Korea, but their specification of the saving equation still leaves questions about Shaw's theory concerning the effect of real interest rates on saving.

Evaluating the effectiveness of the 1965 financial reform in stimulating aggregate saving is complicated by simultaneous changes in a number of other important variables thought to influence saving behavior. Not only did nominal interest rates rise, but price inflation decelerated, possibly exerting independent influences on spending and saving behavior.[2] Trade and exchange rate were also liberalized, and new taxation measures were instituted with an eye on domestic capital mobilization.[3] The economy had taken off to a high-growth era[4] and undergone rapid urbanization.[5] All these factors have been recognized in the literature as possible determinants of saving.

Particularly important was the development in external capital flows over the period. To meet the rapidly-growing development needs, aggregate flows of foreign capital increased greatly in the 60's. Its composition had also changed towards private flows as the real dollar value of official foreign aid rapidly tapered off. These flows have been viewed increasingly as a possible adverse determinant of domestic savings (see Weisskopf, 1972). The negative correlation between domestic saving and external resource inflows can be explained with serveral alternative theories. If the capital inflows cause the decline in domestic saving, as most authors have postulated, this could be due to the consumption of a portion of borrowed resources, or to a tendency of external direct investment

1 Williamson's results were disputed later by Gupta (1970a) for the Indian case.

2 Chandavakar (1971) says, "... price stability is in itself a major factor in sustaining an ideal climate for encouraging financial saving..." Williamson (1968) similarly states, "High rates of price changes should tend to diminish real saving...".

3 For a discussion of trade "liberalization" and development finance, see Little, Scitovsky and Scott (1970).

4 For the effect of growth rate on saving, see Houthakker (1965), Modigliani (1966), Swamy (1968) and Spellman (1976).

5 Gupta (1970b) and Lluch and Williams (1975) report that rural saving propensities are higher than urban.

to displace saving and investing by local capitalists. On the other hand, if a savings shortfall causes increased borrowing, then measured relationship simply indicates the circumstances under which external capital is sought.[6]

Thus, the "financial reform" of 1965 occurred in a context of rapid economic flux. Indeed, a whole series of financial, fiscal and external measures were designed and instituted within the coordinated efforts of the country's first ambitious economic development plan (1962-66). The indisputable surge in the volume of internal savings after 1965 could therefore be attributed to any of these important changes in the economy.[7] Specifying the domestic saving as a function of only income and interest rate, as in several empirical works on Korea (see Brown, 1973 and Frank, Kim and Westphal, 1975), does not appear to be entirely satisfactory for this reason. In this note, we discuss a simple model of domestic saving in an open economy and test simultaneously for the effects of these variables on savings in Korea both at the aggregate and sectoral level. The period covered in the empirical work is from 1954 to 1978, a 25 year post-Korean War period. Our results show the sectoral differences in the basic determinants of domestic savings and call into question the importance of the interest rate reform alone.

The Estimating Framework

Consider a simple identity between the sources and uses of resources: the sources generated from domestic production (A) and from foreign inflows (F) can either be consumed (C) or saved (S). Capital inflows can be viewed as the negative of net exports of goods and services.

$$A + F = C + S \qquad (1)$$

Consumption is a positive function of domestic income, A and of foreign resource inflows, F. It is by now well known that foreign

6 Papanek (1972) postulates still another scenario: both saving and capital inflow may be reacting to such exogenous shocks as war and natural disaster.

7 Williamson (1979) characterizes and analyzes Korean saving differently. His problem is that the private sector saves "too little" compared to public sector or some economy-wide norm; his answer is the existence of differential rate of return on investment in the two sectors because of government policy. We do not agree with his characterization of private saving in Korea since an enormous surge has undisputably occurred in private saving over a short period of time (see Figure 1); his saving rate based on period average within a fixed percentage growth-model framework distorts the picture. We find his analysis unconvincing because he does not explain why the rate of return is lower in private sector than in public sector other than vague references to government policy; can his theory be turned around and explain that the public sector saves "to much?"

capital flows may "leak" into consumption. Indeed, accounting definitions of consumption (which include, for example, investment in human capital) make this most likely. Nor is it surprising that nations would borrow to finance other consumption activities as well. However, there is no reason to expect consumers to react in the same way to changes in domestic income and in foreign resource inflows. Different types of finance for resource inflows should in fact be expected to affect consumption differently. Consumption also is assumed to be a negative function of the expected real rate of interest. All money variables are defined in constant prices. The introduction of real rather than the nominal rate of interest is in the spirit of Shaw and McKinnon. Finally, "s" represents environmental or structural factors under which these variables operate, which are of particular importance in a rapidly-developing economy such as Korea.

$$C = C(A, F, r^e; s) \quad C_1, C_2 > 0, C_3 < 0 \tag{2}$$

The expected real interest rate is assumed to be the same as current real interest rate. Besides simplicity, this may reflect myopic expectations and short-term decision making assumptions that may be appropriate in an environment of considerable uncertainty as in Korea during the period under review.

$$r^e = r \tag{3}$$

Our concern is with domestic saving:

$$SD = S - F = A - C \tag{4}$$

With appropriate modifications, this framework may be taken to portray either an individual sector or the aggregate economy. In totally-differentiated form, we can write

$$dSD = (1 - C_A) dA - C_F dF - C_r dr - C_s ds \tag{5}$$

Subscripts indicate the partial derivates. The effect of a change in domestic income on domestic saving is positive as long as the economy is stable. The effect of a change in real interest rate is positive as expected. The effect of a change in foreign capital inflows on domestic saving, however, would be negative, in general. Structural factors, of course, would have indeterminate influences at this point.

Although our discussion so far has admitted inflation only in the determination of the real interest rate, it may well exert other influences on saving behavior. Thus $C = C(A, F, r^e, \dot{p}; s)$ may be the appropriate consumption function (see Chandavakar, 1971 and Williamson, 1968).

The effect of inflation on domestic saving faces unclear theoretical predictions. If one decomposes the real interest rate into the nominal interest rate and the rate of inflation ($\dot{r} = i - \dot{p}$) in nice Fisherian fashion, the effect of inflation rate on domestic saving is clearly negative.

$$\frac{\partial SD}{\partial \dot{p}} = \frac{\partial SD}{\partial \dot{r}} \cdot \frac{dr}{d\dot{p}} < 0$$

The same story is told according to monetary/portfolio theory. Inflation means a depreciation of the value of money which would result in people getting out of money and into real goods, thus a decline in savings.

If one believes, on the other hand, that uncertainty is an important determinant of consumption-saving behavior and that inflation increases uncertainty, then inflation would cause a drop in consumption and rise in savings due to the precautionary reactions of the people under uncertainty.

Empirical Test

The simple framework above provides a structural backup for the reduced-form equation that will be tested in this section. Besides the variables introduced above, structural factors such as urbanization and oil shock as well as trend and policy dummies will be included in the equations. Inclusion of foreign capital exogenously as a "cause" of domestic saving can be defended by the consistency of the assumption--at least in comparison with the reverse causality assumption--with historical developments in Korea: foreign capital inflows started with the end of war and preceded any domestic saving reaction; similarly, the low-saving state in the pre-war period failed to "induce" external capital inflows.

The measurement of variables is straight forward. The real rate of interest is measured by the nominal interest rate on time deposits for one year and longer minus the rate of change of wholesale price index. Different income measures were used in sectoral regression: disposable income for household saving, non-agricultural income for business saving, and GNP for government as well as aggregate saving. We should also mention that the net capital inflow is measured as imports minus exports of goods and services, net of changes in official reserves of foreign exchange,

because these tend to mask autonomous capital flows in which we are interested. We have not addressed the problem inherent in national income accounting procedures in treating human-capital items as "consumption." Estimation is by ordinary least square[8] on the annual data for 1954-1978[9] All money variables are in billions of wons in 1970 prices.

Our work confronts two methodological problems. First, due to the small sample size, the possibility of spurious correlation cannot be ignored. The second problem--multicollinerity between explanatory variables--makes still more difficult the establishment of significant partial correlations within this small sample. But, since our objective is not to fit the equation perfectly but to find the qualitative conclusions which cut across various specifications, these problems are not critical. However, in one case--that of the real rate of interest and the rate of price inflation--correlation is so high (.96) and the coefficient from the regressions in which both variables appeared are so peculiar and implausible to defend, that we report only results in which *either* the rate of price inflation *or* the real rate of interest appear, not both. The simultaneous reduction in the inflation rate and increase in the real interest rate in Korea in the mid 1960s are too closely correlated to permit a conclusion at this time concerning their separate effects on saving behavior.

Estimation Results: Basic Variables

We ran essentially two sets of regressions. First, we ran base regressions where the interest rate/inflation rate, international resource flows, income and oil shock dummy are included as explanatory variables in aggregate and sectoral savings. The results of these regressions were compared to a set which included a policy dummy for the post 1965 period and another set which included a time trend. If tax laws, protection policy and other non-interest-rate changes of the 1965 reform were of central importance, the dummy variable should be significant (since the interest rate effect is captured already by separate inclusion). If more gradual reforms--such as increased and more systematic use of national

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8 We have also tried Cochrane-Orcutt iterative technique, but no significant improvement in the results is noted on balance (a reduction in autocorrelation may be too small to accept the decline in adjusted R^2 overall), nor are conclusions changed qualitatively.

9 Data sources are: The Bank of Korea, *National Income in Korea,* 1978 and *Monthly Economic Statistics;* United Nations, *Statistical Yearbook;* and Frank, Kim and Westphal (1975).

Table 1

AGGREGATE SAVING BEHAVIOR: BASIC VARIABLES

Independent Variable	1	2	3	4	5	6
Income	.198*	.202*	.213*	.214*	.261*	.255*
	(9.13)	(9.72)	(7.45)	(7.38)	(6.18)	(5.88)
Real Interest Rate	.444		.704		1.151	
	(.56)		(-.82)		(1.34)	
Price Inflation		-.194		-.320		-.703
		(-.23)		(-.36)		(-.77)
Net Capital Inflows	-.264*	-.266+	-.223+	-.237+	-.165	-.183
	(-2.50)	(-2.47)	(-1.90)	(-1.98)	(-1.42)	(-1.51)
Oil Shock	-5.644	-17.588	-21.541	33.101	-25.454	-42.170
	(-.08)	(-.26)	(-.30)	(-.46)	(-.38)	(-.63)
Dummy (1965 on)			-41.595	-30.152		
			(-.82)	(-.61)		
Trend					-12.307+	-9.856
					(1.71)	(-1.39)
Constant	-127.948*	-130.326*	-139.624*	-188.708*	-115.356*	-116.708*
	(-3.18)	(-2.96)	(-3.24)	(-2.96)	(-2.95)	(-2.65)
Adjusted R^2	.949	.948	.948	.946	.954	.951
D.W.	1.43	1.46	1.44	1.48	1.51	1.52

The numbers in the parentheses are "t" ratios.
* Significant at 99% confidence level.
+ Significant at 95% confidence level.

planning--were important, the trend variable should be signifi-cant.

After analyzing results with this set of explanatory variables, we attempted to identify more explicitly the structural factors represented thus far by a time trend or a policy dummy. Thus, we introduced the growth rate of real GNP and the degree of ur-banization into our second set of regression.

As Table 1 suggests, the aggregate saving equations do *not* sup-port the notion that the reforms of 1965 had their effect on saving by increasing real interest rates or through other means. Indeed, apart from the income variable--which shows marginal propensity to save of stable range (20-26%)--only the net capital inflow is significant. A dollar of capital inflow *ceteris paribus* reduces domestic saving by approximately a quarter, confirming partial substitutability between domestic and foreign saving.

Turning to a sectoral analysis of saving behavior within the same framework (Table 2)[10] helps to clarify the aggregate results. As in the aggregate regressions, the real interest rate (or the rate of price inflation) is the variable with the least explanatory power. Only in the public-sector, saving is even remotely interest rate-significant.

Several interesting points emerge from the sectoral saving regressions. First, the effect of capital inflow is most significant in government saving and least in business saving. Government seems to be the one that is most sensitive to the availability of external capital; capital inflows increase non-investment government spen-ding and reduces saving. The unresponsiveness of business saving to capital inflows is a bit puzzling. A closer look at Korean institu-tions and policies, however, suggests that government policies that require matching domestic capital in the case of corporate borrow-ing and affiliation from overseas may have been a factor in cancell-ing out what might otherwise be a substitutive relationship bet-ween domestic and foreign saving.

Sectoral differences are also observed in the oil shock and the trend term. Interestingly, the oil dummy raises saving in the private sector--specially business saving--but reduces government saving. Again, the government seems to have gone on spending during the oil uncertainties partly because of an absence of spen-ding constraint in the range, and partly because of conscientious

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10 Only regressions with the real interest rate are reported, since those with the inflation rate differ trivially from these.

Table 2

SECTORAL SAVINGS BEHAVIOR: BASIC VARIABLES

Independent Variable	Household			Business			Government		
	7	8	9	10	11	12	13	14	15
Income	.127*	.155*	.222*	.026*	.021*	.008	.076*	.074*	.087*
	(5.17)	(4.91)	(4.86)	(6.74)	(4.63)	(1.62)	(7.96)	(5.77)	(4.38)
Real Interest Rate	-.290	.102	.586	.125	.054	-.069	.665+	.628	.787+
	(-.42)	(.14)	(.81)	(1.06)	(.44)	(-.71)	(1.91)	(1.63)	(1.95)
Net Capital Inflows	-.161+	-.099	-.035	.005	-.006	-.022	-.095+	-.101+	-.078
	(-1.72)	(-.97)	(-.36)	(.32)	(-.34)	(-1.69)	(-2.04)	(-1.92)	(-1.43)
Oil Shock	73.581	61.282	89.580+	67.231*	69.560*	65.478*	-85.746*	-83.479*	-89.170*
	(1.40)	(1.18)	(1.89)	(7.03)	(7.42)	(9.48)	(-2.80)	(-2.56)	(-2.83)
Dummy (1965 on)		-61.568			10.694				
		(-1.39)			(1.51)				
Trend			-14.662+			3.113*		5.930	-2.127
			(-2.38)			(4.30)		(.26)	(-.63)
Constant	-106.826*	-127.971*	-103.480*	1.143	2.356	-9.184+	-28.075	-26.411	-25.899
	(2.79)	(-3.17)	(-3.02)	(.23)	(.48)	(-2.11)	(-1.58)	(-1.36)	(-1.40)
Adjusted R²	.868	.874	.894	.969	.971	.984	.890	.884	.886
D.W.	1.44	1.50	1.63	1.07	1.15	1.89	1.50	1.51	1.51

The numbers in the parentheses are "t" ratios.
* Significant at 99% confidence level.
+ Significant at 95% confidence level.

effort to counter the decline in real economic growth, while the private sector undergoes austerity on spending. This different sectoral responses cancel each other out producing insignificant aggregate results. The changes picked up by the trend term also cancel out; the significant positive trend in corporate saving is offset by the negative trend in household saving. In both household and business sectors, the hypothesis that change was occurring gradually over the entire period is chosen over the alternative that the reforms of 1965 generated once-and-for-all changes in policy or structure.

Before we move on, let us summarize the conclusions reached so far. Most suprising, perhaps, in light of the general consensus among those examing Korea's saving of the late 1960's is the failure of the real rate of interest to explain saving at the sectoral or the aggregate level with a possible exception of government saving. Second, the inflow of external capital appears to depress government saving while the business saving is left unaffected; negative signs (though not statistically significant) in household saving make the effect of capital inflow in aggregate saving equation significantly negative. Third, the oil shock in the 70's raised private saving and reduced government saving. Finally, there is also a sectoral cancelling-out of the trend term, and sectoral data suggest that changes are better represented as continuous rather than abrupt (in 1965). The last three points above underscore the importance of disaggregated analysis.

Transfer Payments and Structural Factors: Revised Specifications

So far we have explored the effects of the reforms of 1965 on saving behavior in a framework which recognizes explicitly the impact of income, the real interest rate, capital inflows and the oil shock on saving behavior. In view of the fact that external capital flows changed in composition significantly over time in Korea, it would be interesting to see how different kinds of external capital affects domestic saving. We therefore introduced transfer payments and interest-bearing flows separately in the regression. Also, as discussed earlier, considerable attention has focused on the importance of income growth and demographic variables on household saving. We therefore conducted further experiments to see whether the "residual" categories of time trend and the policy dummy could be replaced by these two variables, the effects of which have somewhat better theoretical groundings.

The results of these experiments are encouraging (Table 3). The decomposition of capital inflow highlights the conflict in the effects of the two different categories of external capital on domestic saving: inflows of interest-bearing capital reduce domestic saving as seen previously in the runs with aggregate capital flow, but transfer payments increase domestic saving. Furthermore, the magnitude of the effect of the unilateral transfer is shown to be about 200%. The apparent anomaly, however, can be understood as a reflection of a unique Korean scene in unilateral service flows. Many Korean construction workers in Vietnam and

Table 3

EFFECTS OF TRANSFER PAYMENTS AND STRUCTURAL VARIABLES:
Revised Specifications

	Aggregate Savings		Household Savings	
	16	17	18	19
Income	.235*	.267*	.104*	.213*
	(9.57)	(9.25)	(3.26)	(5.86)
Real Interest Rate	.130	1.552+	−.690	.897
	(.18)	(2.14)	(−.95)	(1.26)
New Capital Inflow-Total		.013		.097
		(.12)		(.90)
Transfer Payments	1.888+		2.055	
	(2.13)		(1.27)	
Interest Bearing Flows	−.235+		−.245+	
	(−2.48)		(−2.37)	
Oil Shock	−36.495	−56.268	85.510	60.541
	(−.58)	(−1.05)	(1.65)	(1.43)
Urbanization		−29.854*		−27.228*
		(−3.57)		(3.29)
Economic Growth		14.732*		10.290*
		(3.83)		(2.77)
Constant	−367.735*	955.061*	−127.066*	883.525*
	(−3.52)	(3.04)	(−3.61)	(2.87)
Adjusted R²	.959	.972	.877	.915
D.W.	1.57	1.54	1.32	1.54

The numbers in the parentheses are "t" ratios.
* Significant at 99% confidence level.
+ Significant at 95% confidence level.

the Middle East get paid a large portion of their salary in won back home--often in the form of bank deposits--for their families, so that when a part of their dollar pay is remitted home, it automatically, "generates" a large won income base and hence savings. The fact that no such "anomalies" are observed in business and government saving backs up this conjecture.

Inclusion of urbanization and economic growth also yields surprising results. When they are included, the real rate of interest becomes significant in aggregate saving equation due to the government saving sensitivity to the real interest rate. The urbanization variable is highly significant, with the effect suggested by the work of Lluch and Williams (1975): *ceteris paribus* urbanization reduces household saving. The rate of income growth also appears to affect aggregate and household saving positively.[11]

Finally, it is interesting to note the effect of respecifying the saving function on the coefficients of other variables. The marginal propensity to save in the aggregate saving equations are in the same order of magnitude, indicating that the estimated results are basically stable. That the coefficient of total capital inflow has become insignificant in the aggregate saving plus the fact that differential response patterns are observed not only across sectors but between the components of external capital, suggest a cautious interpretation of the substitutability hypothesis. Both the urbanization and economic growth perform better in combination than used alone. The results of the regressions which include urbanization and economic growth are superior to those with a policy dummy or a trend term, or to the one with basic variables only (compare Table 3 to Table 1 and 2). This experiment leaves one reasonably confident that the urbanization and the economic growth are major components of the trend term observed in the earlier analysis.

Conclusion

We have shown how a saving function in Korea which draws on various strands of economic theory--theory concerning the effects of income, of interest rates, of resource flows from the rest of the world, of demographic and structural variables--gives results

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11 Government and business saving (not shown in the table) are somewhat selectively sensitive to these variables: economic growth only is significant in government saving and urbanization only in business saving. What is more, the urbanization is *positively* significant in the business saving equation. This, however, is not without explanation: migration of people to urban industrial centers increases the opportunity of profitable business expansion *à la* Lewis' surplus labor model.

which are at odds with more narrowly specified functions in which only the interest rate--sometimes the nominal rate at that-- augments income. The fact that respecifiction alters results is not in itself surprising, of course. But in this case a widely held view, indeed a growing part of the "conventional wisdom" about Korea, turns out to be difficult to substantiate. One must be skeptical whether relaxation of financial repression in Korea, as measured by increases in real interest rates,[12] caused the boom in saving. The present analysis underlines the need for more careful, disag- gregated analysis to establish whether the financial reforms of 1965 did indeed have the key role usually ascribed to them.

In addition to the cautionary note sounded above, we present the following results to inform further research:

1) Basic economic performance variables (income, growth rate) and structural-changes variable (urbanization) are important in explaining savings in Korea.

2) Inflows of interest-bearing external capital appear to substitute partially for domestic saving at the aggregate level and particularly in government saving. The substitutability between foreign and domestic saving, however, appears to be cancelled out in business saving because of matching domestic-capital require- ment. Transfer payments complement household saving.

3) The real rate of interest is generally insignificant in Korean saving. Only the government saving is even remotely real interest rate-sensitive, probably a reflection of government intention to boost saving with interest rate reform; pubic enterprises faithfully follow announced government intention while the private agents can react to it producing different results.

4) The oil shock in the 70's caused an increase in saving by the public sector while the government saving is decreased.

5) The results support the hypothesis that change occurred continuously rather than abruptly as a result of financial and non- financial reform in 1965.

Our analysis surely opens more questions than it settles. We hope we have demonstrated the need for further comprehensive, disaggregated analysis of Korea's "saving miracle" before one can feel confident drawing lessons for other economies.

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12 This, although related, is not a direct test of the Shaw's hypothesis. A direct test of the Shaw's hypothesis — the complementary between money and saving — is found, for instance, in Yoo (1977).

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