Financial Intermediation, Interest Rate and Structure of Savings: Evidence from Asia*

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I. Introduction

In recent years, there has been a resurgence of interest, inspired largely by the works of McKinnon and Shaw, in the role of financial factors in the growth of developing countries. One aspect of this interest has been the emphasis on the role of interest rates as a determinant of savings. However, these works have not provided any new theoretical insights into the relationship. It is rather based on the *assertion* that high interest rates do matter. As we know the traditional answer to whether interest rates affect savings is an ambiguous one, depending as it does on a positive income effect and a negative substitution effect, so that it is not possible to predict the net outcome on an *a priori* basis. Apart from this, in the devloping countries there is yet another problem when we study the behavior of aggregate private savings. This has to do with the measurement of these savings. Savings are normally measured as a residual from actual capital accumulation minus other sources of finance. Since estimates of actual investment are often inadequate, because of incomplete coverage,

* This paper is part of a larger project on the role of financial intermediation in the growth of developing countries. It is being funded by SSHRCC Grant No.: 410-81-0615 and the University of Alberta. Thanks are due to Anisul Islam for his excellent research assistance. It was written during the author's leave as a McCalla Research Professor for the year 1982-83. An earlier version of this paper was presented at the Missouri Valley Economic Association, St. Louis, Missouri, 1983. I would like to thank Don Schilling for his detailed comments.

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say underestimation from agriculture and the nonmonetized sector, it follows that savings estimates are suspect too.

These problems have shifted attention to the study of savings in the form of financial assets. Data on financial assets can be computed for a large number of developing countries in the *International Financial Statistics*, published by the IMF. These data are fairly reliable. Apart from the greater reliability of data, the interest rate effect is unambiguous in this case. An increase in deposit rates leads to a portfolio reallocation for the private sector. Given the size of total savings, an increase in the own rate of return on financial assets will lead to a shift from savings in physical to financial assets. Moreover, it can be easily shown that the surplus flows from the traditional to the modern sector are identical with household savings in financial assets. Since a crucial ingredient in the development process is the transfer of resources from less to more productive sectors, a study of financial savings is useful regardless of what happens to total savings.

The scheme of the paper is as follows. Section II demonstrates the equivalence of financial and surplus flows. In Section III we describe the model used. The data are described in Section IV. Section V presents the results. Section VI concludes with a brief summary of the main findings.

II. Equivalence of Surplus Flows and Financial Flows[1]

Consider the following input-output model of income generation in which the household sector is treated as a production sector. Its inputs are various consumption goods and services and its 'output' is labour. The model is represented by the following matrix:

	1 Agriculture	2 Manufacturing	3 Urban Households	4 Rural Households	5 Autonomous Demand
1. Agriculture	A_{11}	A_{12}	A_{13}	A_{14}	I_a

[1] This section draws heavily from Gupta (1970).

	1 Agri-culture	2 Manu-factur-ing	3 Urban House-holds	4 Rural House-holds	5 Autono-mous Demand
2. Manufacturing	A_{21}	A_{22}	A_{23}	A_{24}	I_m
3. Urban Households		W_1			
4. Rural Households	W_2				
5. Primary Inputs (retained earnings or savings)		π	S_u	S_r	I_a+I_m

where A_{ij} stands for the flow of goods from sector i to j; W_1 and W_2 are urban household and rural household incomes, respectively; π represents retained earnings of the manufacturing sector; S_u and S_r are savings of the urban and rural households, respectively.

In this model, all the entries are in money terms. The payments to households are given in the third and the fourth row of the matrix and the use of this income is shown in the corresponding columns.

From this matrix we can derive the following identities:

$$(1)\quad A_{11} + A_{21} + W_2 \equiv A_{11} + A_{12} + A_{13} + A_{14} + I_a$$

$$(2)\quad A_{12} + A_{22} + W_1 + \pi \equiv A_{21} + A_{22} + A_{23} + A_{24} + I_m$$

$$(3)\quad A_{13} + A_{23} + S_u \equiv W_1$$

$$(4)\quad A_{14} + A_{24} + S_r \equiv W_2$$

Adding (1)-(4) gives

$$(5)\quad S_u + S_r + \pi = I_a + I_m \quad \text{, or}$$

$$S_u + S_r - I_a = I_m - \pi \quad \text{, or}$$

$$S - I_a = I_m - \pi$$

where $S = S_u + S_r$. Here S may be regarded as purchase claims of the households on the two production sectors.

From equation (5), it is clear that in our model any excess of investment over the resources available within the manufacturing sector is met by a flow of resources from the household sector after deducting expenditure on investment within the agriculture sector. Thus we may write

$$(6) \quad FF = I_m - \pi = S - I_a$$

when FF represents the financial flows from the household sector to the manufacturing sector.

Adding (1), (3) and (4) gives us

$$(7) \quad S_u + S_r - I_a = (W_1 + A_{12}) - (A_{21} + A_{23} + A_{24}) \quad , \text{or}$$

$$S - I_a = (W_1 + A_{12}) - (A_{21} + A_{23} + A_{24}$$

Interpreting all financial flows as physical flows, we can see that $(W_1 + A_{12})$ represents the flow of real resources from the households and the agriculture sector (call them the primitive sector jointly) to the manufacturing sector. $(A_{21} + A_{23} + A_{24})$ represents the flow of real resources from the manufacturing sector to the primitive sector. Hence the difference constitutes the net flow of real resources from the primitive to the manufacturing sector and from equation (6) this is equal to the financial flows of the household sector. Hence from the point of view of the flow of resources from the primitive to the manufacturing (modern) sector, we need only concentrate on the financial flows.

But we must note that since $FF = S - I_a$, the financial flows are crucially dependent on I_a. The absolute amount of FF can be increased by simply reducing I_a. This poses the important question of substitutability between physical and financial assets in the households' portfolios. We explore this question in Section IV.

III. The Model

The basic model used is:

$$(8) \quad FS = a_0 + a_1 YP + a_2 YT + a_3 PE + a_4 PU + a_5 NI + a_6 FIR + a_7 VE$$

where FS is financial savings, YP permanent income, YT transitory income, PE expected inflation, PU unanticipated inflation, NI nominal interest rate, FIR financial intermediation ratio and VE represents uncertainty with respect to inflation to be defined below. In order to examine the question of substitutability, the same equation was also estimated for savings in physical assets, to be denoted by SP. The *a priori* signs of the coefficients for the two types of savings are given in Table 1.

Table 1

EXPECTED SIGNS OF THE COEFFICIENTS

	FS	PS
a_1	>0	>0
a_2	>0	>0
a_3	<0	>0
a_4	$\gtrless 0$	$\gtrless 0$
a_5	>0	<0
a_6	>0	$\gtrless 0$
a_7	<0	>0

Because of severe collinearity between NI and PE for a number of countries, we were obliged to estimate a modified version of equation (8) in which we used the real rate of interest (RNI = NI–PE). The expected sign of this variable is positive for FS and negative for SP. This formulation differs from (8); in (8) the coefficients of PE (a_3) and NI (a_5) are not necessarily equal, whereas in the modified case they are assumed to be

equal. This restriction is not necessarily justified in terms of any *a priori* considerations, but we had little choice because of the reason mentioned above.

A brief discussion of the model is now in order. The inclusion of YP and YT needs little justification. NI and PE can be treated as own rates of return on FS and PS, respectively, and according to the traditional demand theory we expect the own rate to have a positive effect and in a two asset model, the alternate asset's rate to have a negative effect. The effect of unexpected inflation is unpredictable. The uncertainty variable has not been normally included in studies of savings behavior.[2] Recently Klein argued about the need for including uncertainty about the expected rate of inflation as an independent variable in the demand for money function. His argument is that increased variability of the inflation rate makes the task of forecasting future inflation even more difficult, thereby creating greater uncertainty. In terms of the prediction of its sign, it is suggested here that the uncertainty factor should be of the same sign as the expected rate of inflation. This explains the opposite signs in Table 1.

The variable FIR has been included to capture the direct effect on the composition of savings of the spread of banking and other similar activities and the availability of wider array of financial instruments. It has been argued in the literature that financial intermediation, quite apart from the effects of changes in interest rates, stimulates saving.[3] We suggest that this effect may also exhibit itself in changing the composition of savings in favor of financial assets.

IV. Data and Estimation

The data on financial savings relate to the non-financial private sector and are defined as the change in the financial asset holdings of this sector. Since no direct estimates are available, financial assets are measured from the liability side of governments and financial institutions as given in the *International*

[2] See, however, Gupta.

[3] See, Goldsmith.

Financial Statistics (IFS). More specifically the following items from the *IFS* were used to calculate the financial assets:

Table 2

ASSETS COMPRISING FINANCIAL SAVINGS

Symbol	Name of asset	IFS Line No.
A_1	Currency outside banks and money with banks	34
A_2	Quasi-money with banks	35
A_3	Post-office savings deposits	45i
A_4	Bonds of other financial institutions	46a
A_5	Capital accounts of other financial institutions	47a
A_6	Change in life insurance liabilities (= assets)	49z.s

Financial savings are defined as

$$(9) \quad FS = \Delta(A_1 + A_2 + A_3 + A_4 + A_5) + A_6 .$$

Savings in physical assets (SP) were calculated as the residual:

$$(10) \quad SP = S - FS$$

where S is total savings as given in the *World Tables*, 1980. The price index used to estimate the expected inflation and as a deflator was the consumer price index. The nominal interest rate refers to the rate of interest on savings deposits as given in Fry. The financial intermediation ratio (FIR) was defined as the ratio of all financial assets to income. Permanent income was defined as a three year simple moving average and transitory income as the difference between actual and the permanent income. Expected inflation series was generated from the equa-

tion for total savings in which expected inflation was defined as a weighted average of current and past inflation rates with the weights being determined as part of the regression program.

Then unanticipated inflation was defined as the difference between the actual (current) and expected rates on inflation. The inflation uncertainty variable, VE, was defined as

$$(11) \quad VE = \frac{1}{3} \sum_{i=1}^{3} \left| \dot{P}_{t-1} - \dot{P}_{t-i-1} \right|$$

This measure is due to Blejer. The data used were annual and covered the period 1960-1977. It has already been pointed out that the data on total savings suffer from an unspecified measurement error and therefore so do the estimates of savings in physical assets. It should also be added that even the estimates of financial savings may be underestimated because of the incomplete coverage of the financial assets. However, this is much less likely because for most of the developing countries financial assets, other than currency, demand, savings and time deposits, constitute only a very small fraction of the total financial assets.

V. The Results

The results of equation (8) and its modified version, wherever necessary, are given in Table 3. We discuss them on a country by country basis.

Burma:

The income variables do not seem to perform well at all. Permanent income and transitory income have the wrong sign in the equation for FS and SP, respectively, though neither of them is statistically significantly different from zero. Even the remaining income variables are barely significant. The coefficients of expected inflation, the nominal interest rate and the financial intermediation ratio have the expected signs, suggesting that financial and physical assets serve as substitutes in the private sector's portfolio. However, once again the significance of these variables, other than the FIR, is marginal, suggesting that financial savings are not too sensitive to variations in real interest

Table 3

STATISTICAL RESULTS*

Equation	Burma		India		Indonesia		Korea		Malaysia		Nepal	
	FS	SP	FS	SP	FS	SP	FS	SP	FS	SP	FS	SP
Constant	-2,924.14	4,658.15	-20,153.2	-45,909.0	-17.644	-16,077	-1,160.4	-78.14	-1,352.90	-1,527.86	49.618	1,128.1
	(.86)	(1.21)	(3.49)	(4.46)	(2.02)	(.92)	(2.16)	(.12)	(1.80)	(1.81)	(.12)	(1.86)
YP	-.1845	.2919	.0625	.2714	.0055	.1860	.1697	.0773	.1464	.7538	.0095	.1020
	(.92)	(1.29)	(4.13)	(10.03)	(.48)	(8.01)	(2.46)	(1.21)	(2.66)	(6.43)	(.33)	(2.32)
YT	.1925	-.0205	.3300	-.1904	.0842	.2297	-.0682	.7657	.5064	.1592	-.0024	-.0336
	(1.26)	(.12)	(4.09)	(.76)	(2.16)	(2.94)	(.59)	(5.29)	(4.08)	(.97)	(.04)	(.39)
PE	-73.083	79.661										
	(1.19)	(1.14)										
PU			-1,196.24	630.573	-.1014	.5736	-26.815	16.057	-189.891	59.579	-15.007	
			(10.37)	(3.06)	(.400)	(1.13)	(4.08)	(1.94)	(5.11)	(1.81)	(1.84)	
NI	721.698	-940.608										
	(1.23)	(1.41)										
RNI			723.815	-712.749	-.054	-.3937	22.049	-32.512	18.770	48.102	22.239	-21.347
			(2.35)	(1.30)	(.45)	(1.65)	(2.35)	(2.75)	(.413)	(.78)	(1.40)	(.92)
FIR	138.516	-170.957			2.2776	-1.877	11.830	9.111		-233.057		
	(1.78)	(1.94)			(2.41)	(.99)	(2.74)	(1.68)		(4.63)		
VE									-328.973			
									(2.87)			
$\bar{R}^2$	.313	.023	.957	.890	.902	.985	.719	.939	.809	.939	.316	.181
D.W.	1.72	1.69	1.32	1.74	1.75	3.04	2.10	2.37	2.45	1.41	1.91	2.31

Table 3 (cont'd)

Equation	Pakistan		Philippines		Singapore		Sri Lanka		Taiwan		Thailand	
	FS	SP	FS	SP	FS	SP	FS	SP	FS	SP	FS	SP
Constant	-4,545.80 (.69)	-427.70 (.08)	-11,359.3 (1.62)	30,295.8 (2.91)	-2,239.81 (1.66)	333.16 (.45)	-5,512.50 (5.24)	-1,355.13 (.72)	17.091 (3.64)	55.186 (5.94)	-41.095 (1.55)	100.714 (6.46)
YP	.0482 (.63)	.0669 (1.21)	.0343 (1.70)	.1705 (5.91)	.0026 (.04)	.2320 (5.72)	.0674 (1.97)	.1871 (3.07)		.5396 (10.35)	.0020 (.02)	.3978 (8.14)
YT	.7501 (1.98)	.2188 (.63)	.3521 (2.15)	.2802 (1.15)	.4474 (1.88)	-.0945 (.73)	.2860 (2.46)	-.1889 (.91)	.1923 (1.78)	.5882 (3.06)	.0073 (.04)	.2426 (2.20)
PE										1.0215 (2.70)	-.6752 (2.57)	.7419 (4.80)
PU		654.691 (3.48)	-190.877 (4.45)	215.908 (3.38)	-63.909 (3.09)	84.744 (7.53)	-85.325 (2.71)	100.462 (1.79)	-1.546 (11.54)	1.1745 (9.73)	.4247 (3.10)	.3397 (4.22)
NI										-3.876 (4.47)	4.0385 (1.05)	-11.5869 (4.89)
RNI	497.283 (1.92)	-267.150 (1.43)	135.314 (1.08)	2.663 (.01)	9.268 (.33)	-50.706 (3.34)						
FIR			325.248 (1.39)	-1,142.97 (3.28)	40.766 (1.49)	-16.635 (1.11)	171.372 (5.91)	16.677 (.32)	.8179 (6.29)	-2.404 (7.82)	.7453 (1.05)	-2.3745 (5.69)
VE					-26.930 (.69)	85.305 (4.01)			-1.244 (6.37)			
$\bar{R}^2$	.279	.568	.788	.957	.987	.990	.872	.555	.929	.988	.796	.985
D.W.	2.21	1.96	1.90	2.42	2.35	2.62	1.59	2.68	1.42	1.47	1.511	2.13

* 't' values are given in the parentheses.

rates, the same being true of savings in physical assets. The overall explanatory power of the equation, as measured by the $\bar{R}^2$, is extremely low which could be due either to the specification used, the definitions of the variables employed and above all measurement errors in the data. It is evident that a great deal more work needs to be done on this country before any reliable conclusions can be drawn. However, the direction of the effects of PE, NI and FIR is highly suggestive.

India:

For the FS equation, both income variables are highly significant, whereas YT has the wrong sign in the SP equation though not significantly different from zero. Unanticipated inflation has a significant though opposite effect on the two types of savings, discouraging accumulation of financial assets but encouraging the accumulation of physical assets. The real rate of interest has the expected effect and highly significant for FS but only marginally for SP. Th almost equal magnitude of the coefficient in the two equations is noteworthy. It suggests that the two forms of savings serve as almost a perfect substitute in response to variations in real interest rates. However, in this case financial intermediation does not seem to have any direct effect. The overall explanatory power of the two equations is quite satisfactory, with about 90 percent of the variation being explained.

Indonesia:

In the FS equation YP is insignificant whereas YT is significant suggesting that financial savings are influenced largely by growth in income rather than its level. Physical savings on the other hand are significantly influenced by both. Unanticipated inflation has virtually no effect on FS and only marginal, but positive effect on SP. The real rate of interest does not affect FS (the sign is wrong) though it has the expected and marginally significant effect on SP. But this result is asymmetric and needs further exploration. FIR has expected signs for both but is only marginally significant for SP suggesting that the direct effect of financial intermediation is stimulative. But note once again the closeness of the two coefficients. The overall explanatory power is quite good with $\bar{R}^2$ being above .90 for both.

Korea:

Permanent income is significant in the FS equation and marginally significant in the SP equation. Transitory income is

significant for SP only. Unanticipated inflation affects both but in the opposite direction, FS negatively and SP positively. Real interest affects both significantly and in the expected direction. FIR is highly significant for FS and marginally for SP and has a positive effect on both suggesting a stimulating effect on total savings. The explanatory power is much better for SP (94%) but for FS, we still need to explain another 28 percent of the variation. The inappropriate sign of YT in the FS equation suggests possible difficulties.

Malaysia:

Income variables have the correct signs for both but YT is not significant for SP. Unanticipated inflation affects both but in opposite directions, FS negatively and SP positively. It is highly significant for FS and almost significant for SP. The real interest rate does not have a coefficient which is significantly different from zero for either. FIR affects SP significantly and negatively. The failure of FIR to appear in FS is an anamoly. Uncertainty about inflation has a significantly negative effect on FS. The explanatory power for both is quite satisfactory.

Nepal:

The explanatory power of the model is very poor. Unanticipated inflation has a negative effect on FS. The real rate of interest has the expected signs in the two equations, though marginally significant for FS only. Note, however, the closeness of the two estimates.

Pakistan:

The income variables perform very badly. Unanticipated inflation has a positive and significant effect on SP. The real rate of interest has expected signs. Its coefficient is almost significant for FS and marginally significant for SP. The explanatory power of the model is very poor for FS. Even for SP, the model explains only about 57 percent of the variation.

Philippines:

The income variables have the correct size and all of their coefficients are either highly significant or marginally significant. Unanticipated inflation is highly significant for both but has opposite sign, being negative for FS and positive for SP. The real rate of interest is only marginally significant for FS and not at all for SP. FIR has the expected signs. Its coefficient is marginally

significant for FS but highly significant for SP. The explanatory power is quite high for SP but only adequate for FS, leaving about 23 percent of the variation still to be explained.

Singapore:

The income variables perform in an erratic fashion. YP is significant only for SP whereas YT is marginally significant only for FS and even has the wrong sign for SP. Unanticipated inflation is highly significant for both but with opposite signs, negative for FS and positive for SP. Real interest rate has the expected signs but is insignificant for FS, though highly significant for SP. FIR has the expected signs but is only marginally significant for both. VE also has expected signs but is significant only for SP. The explanatory power of the model is quite good for both.

Sri Lanka:

Except YT in the equation for SP, all other income variables are significant for FS and marginally significant for SP and has opposite effect with negative on FS and positive on SP. FIR affects positively and significantly only FS. The explanatory power of the model for FS is satisfactory but not for SP.

Taiwan:

Both YP and YT are highly significant for SP but only YT appears in the equation for FS and even that is marginally significant. The effect of interest rate, though consistent with expected signs, is asymmetrical. It has no effect on FS but both PE and NI have expected and significant coefficients on SP. FIR is highly significant in both with signs being the expected ones. Inflation uncertainty has a significantly negative effect on FS. The model explains over 90 percent of the variation in both.

Thailand:

Neither YP nor YT are significant for FS but both have expected and highly significant effect on SP. Expected inflation has expected and significant effect. Unexpected inflation exerts a highly significant effect on both, negatively on FS and positively on SP. The nominal rate of interest also has expected signs but is only marginally significant for FS. FIR also has the expected signs but, again, is only marginally significant for FS. The model performs quite well for SP but leaves about 20 percent of the variation in FS unexplained.

In order to provide a comparison of the major results across the twelve countries, we have summarized these results in Tables 4 and 5. Table 4 brings together effects of interest rate (real, nominal) and the financial intermediation ratio. Leaving aside those cases where the coefficients are not statistically significantly different from zero, it can be seen that except for the sign of FIR in the equation for SP for Korea, all of the coefficients have the expected signs. However, in quantitative terms, interest rate has a significant effect on FS in only four countries — India, Korea, Pakistan, and Thailand. In Taiwan the effect is significant on SP, though curiously not on FS which is difficult to explain. Turning to the effect of FIR, it is significant for six countries —

Table 4

EFFECTS OF INTEREST RATE AND FINANCIAL INTERMEDIATION*

	PE		NI		RNI		FIR	
	FS	SP	FS	SP	FS	SP	FS	SP
Burma	-(ms)	+(ms)	+(ms)	-(ms)			+(s)	-(s)
India					+(s)	-(ms)		
Indonesia					-(ns)	-(ms)	+(s)	-(ms)
Korea					+(s)	-(s)	+(s)	+(ms)
Malaysia					+(ns)	+(ns)	+(ns)	-(s)
Nepal					+(ms)	-(ns)		
Pakistan					+(s)	-(ms)		
Philippines					+(ms)	+(ns)	+(ms)	-(s)
Singapore					+(ns)	-(s)	+(ms)	-(ms)
Sri Lanka							+(s)	+(ns)
Taiwan		+(s)		-(s)			+(s)	-(s)
Thailand	-(s)	+(s)	+(ms)	-(s)				

Source: Table 3.

* Legend: +, -: signs of the coefficients as given in Table 3.
s: significant at 5% level or close to it.
ms: marginally significant when the coefficient is greater than its own standard error.
ns: not statistically significant where the coefficient is smaller than its own standard error.

Burma, Indonesia, Korea, Philippines, Sri Lanka, and Taiwan. It is interesting to note that except for Korea and Taiwan, the other four countries are those whose interest rate had either no effect or was of only marginal significance. This may suggest that spread of financial intermediation facilities does contribute to an increase in financial savings quite apart from the effect of

Table 5

EFFECT OF UNANTICIPATED INFLATION*

	FS	SP
Burma		
India	-(s)	+(s)
Indonesia	-(ns)	+(ms)
Korea	-(s)	+(ms)
Malaysia	-(s)	+(ms)
Nepal	-(ms)	
Pakistan		+(s)
Philippines	-(s)	+(s)
Singapore	-(s)	+(s)
Sri Lanka	-(s)	+(ms)
Taiwan	-(s)	+(s)
Thailand	-(s)	+(s)

Source: Table 3.

* For explanations of s, ms, and ns, see Table 4.

changes in interest rates. Only in Korea and Taiwan do the interest rate (real) and FIR effects seem to have occurred together.

The effect of unanticipated inflation are brought together in Table 5. These results are very consistent. For ten countries, excluding Burma and Pakistan, unexpected inflation has a negative effect on FS. Of these ten, the effect is significant for eight. For SP, the effect is positive for ten and significant for six. On the whole, it appears that unanticipated inflation, like expected inflation, also discourages savings in financial assets.

VI. Concluding Remarks

In this paper we have examined the effect of nominal interest rates, expected and unexpected inflation, and financial intermediation on the composition of private savings. For a sample of tweleve Asian countries, we have found that real interest rates do affect this composition, though there are wide variations in this effect across the twelve countries studied. Inflation, both anticipated and unanticipated discourages savings in financial assets and encourages savings in physical assets. Financial intermediation, in the form of the spread of financial institutions and diversification of financial instrument is conducive to changing the form of savings in favor of financial savings. At the same time, it needs to be stressed that the support for higher nominal interest rate policy is not overwhelming. Before a stronger case can be made, a great deal more work must be done.

Our results are subject to a number of limitations, some of which have already been pointed out. But one major limitation needs to be reemphasized. This has to do with the definitions of savings and income used. Correctly speaking, it is only the savings of the household sector which are thought to be interest-rate sensitive. The corresponding income variable should also relate to this sector. Unfortunately, available data do not permit construction of theoretically ideal variables for the twelve countries under study. Whether the interest rate and financial intermediation sensitivity of our results will alter significantly for the more appropriately defined variables is an open question.

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