

Capital Gains Versus Current Income in the Farming Sector

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The value of farm assets has increased in most years since the Great Depression, mainly because of rising farm real estate prices. Prior to this decade, such annual increases in asset values were often equal to from one-third to two-thirds of net farm income (including landlords' net rent). In a few years of sharply improving farm output prices and income--1950, 1958, 1965--they approached or even slightly exceeded the current income. But after 1970 annual increases in asset values have each year exceeded annual net income, often by wide margins; for instance, by more than three times in 1976 and 1978.

This session is to explore the nature and implications of the apparent wide divergence between asset appreciation and income. The assignment of this paper is to set the stage for that discussion by examining the magnitude and causes of asset appreciation.

The first part of this paper notes that asset appreciation should be adjusted for general price inflation before it is compared with income.

The author greatly appreciates the advice and data on asset values and the return to assets that he has received over a period of years from Carson Evans and Bruce Hottel, ESCS, U.S. Department of Agriculture. Balance sheet and income data available from ESCS as of July 1979 are used in this study, except that farm income data for 1979 are projections by the author.

The analyses and conclusions are those of the author and do not necessarily reflect the views of the Board of Governors or of other members of its staff.

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The comparable series, known as real capital gains, has been roughly equal to net farm income during this decade. Next, the primary origin of these very significant real capital gains is traced to the fact that, contrary to the popular impression, the current return to farm assets has grown rapidly over the past 25 years, even when measured in constant dollars. It is then shown that, according to asset-pricing theory, a farm economy characterized by rapid growth in the real current return to assets will tend to experience large annual real capital gains and a low rate of current return to assets--which corresponds to actual experience in most years since the mid-1950's. This inescapable tendency has serious and paradoxical implications for the structure of agriculture and for farm policy, which are briefly sketched in the concluding remarks.

I. Capital gains

At the aggregate sector level, analytical work on increased asset values as a form of return to farming seems to have been stimulated by Hathaway's 1957 observation that significant asset value increases were occurring in most years, and in particular by his technical error in adding asset value increases to net income and publishing the total.

The work that followed thus focused on constructing series that could validly be compared with net income. In the early 1960's, Grove first pointed out that annual net investment in farm assets should have been subtracted, and then Hoover and Boyne independently noted the further need for including gains or losses, on both assets and debt, resulting from changes in the general price level. Since the series constructed by Hoover and by Boyne included gains or losses on the purchasing power

of funds owed to others, they could not be called "asset price appreciation;" their authors labelled them "real capital gains." The real capital gains series were next discussed and updated by Bhatia in 1971, and more recently by Brake and Melichar (pp. 445-447) and by Melichar and Sayre (1975, 1977).

In this section, real capital gains are computed in the manner used by Melichar and Sayre in the Agricultural Finance Databook--Annual Series (1977, pp. 58-62).

The process of computing real capital gains is started in Table 1. Columns A through C present the annual change in the value of physical assets, as calculated from the Balance Sheet of the Farming Sector in current prices (Evans, pp. 4-5). Columns D through F show total net investment and net transfers into the farming sector as implicitly revealed by annual changes in USDA estimates of the value of farm assets in 1967 prices (Evans, p. 14). Subtracting net investment from the total change in value yields series known in the literature as "nominal capital gains," shown in columns G through I. (For financial assets and liabilities, nominal capital gains are always zero; thus Table 1 omits these items.)

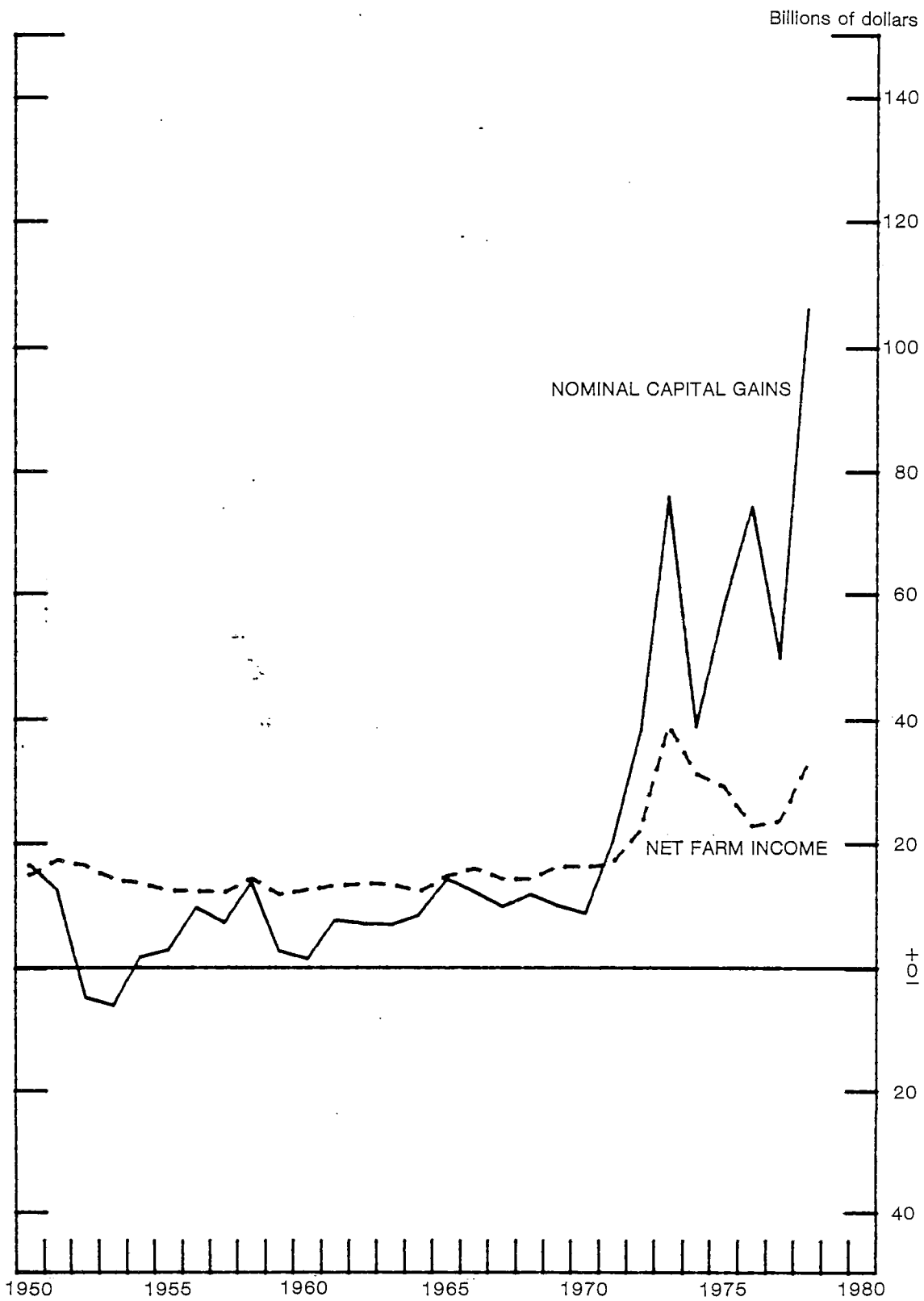
Table 1. Computation of implicit nominal capital gains (billions of current dollars)

Year	Change in value of physical assets			Less:			Equals:		
	Total	Real estate	Other physical assets	Implicit net investment and inter-sector transfers			Implicit nominal capital gains		
				Total	Real estate	Other physical assets	Total	Real estate	Other physical assets
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	
1950...	20	12	8	3	1	2	16	11	6
1951...	15	9	6	3	1	2	12	8	4
1952...	-3	2	-4	2	1	1	-5	1	-5
1953...	-3	-1	-2	3	1	2	-6	-2	-4
1954...	4	4	0	2	1	1	2	3	-1
1955...	4	5	-1	1	1	1	3	4	-1
1956...	9	8	1	-1	1	-2	10	7	2
1957...	8	6	2	1	1	0	7	5	2
1958...	16	9	7	3	1	2	14	8	5
1959...	3	6	-3	0	1	0	3	5	-3
1960...	1	1	0	0	0	-1	1	1	0
1961...	8	6	2	0	0	1	8	6	2
1962...	8	6	2	1	0	1	7	6	2
1963...	8	8	0	1	0	1	7	8	-1
1964...	7	9	-1	-1	0	-1	9	9	0
1965...	16	12	5	2	0	2	14	11	3
1966...	13	10	3	1	1	0	12	9	3
1967...	13	11	2	3	0	3	10	10	0
1968...	14	9	4	2	0	2	12	9	3
1969...	11	7	5	1	1	0	10	5	5
1970...	10	7	2	1	2	0	9	6	3
1971...	24	16	8	4	2	3	20	15	5
1972...	41	28	13	3	2	1	38	26	12
1973...	82	60	21	6	2	3	76	58	18
1974...	37	41	-3	-1	2	-4	39	38	0
1975...	61	48	12	2	-1	3	59	49	10
1976...	74	67	7	0	0	0	74	67	7
1977...	56	42	14	6	0	6	50	42	8
1978...	105	74	31	-1	0	-1	106	74	32

Chart 1, in which nominal capital gains are compared with income, is included here primarily because a similar chart is published annually by the USDA (Evans, p. 17). As already noted, however, this comparison is misleading. If all of net farm income is transferred out of the farming sector (for instance, spent for consumer goods or nonfarm investments), the real wealth position of the sector is not changed. In a time of general price inflation, that also holds for real capital gains, but not for nominal gains.

Chart 1

Nominal capital gains compared with net farm income



In Table 2, the computation of real capital gains is continued. Columns D through H of Table 2 show the adjustments made for the gains or losses resulting from each year's change in the purchasing power of the funds tied up in assets or of the funds owed. (The price index used for this purpose is the USDA index of prices paid by farmers for family living items, as extended beyond 1976 by reference to percentage changes in the Consumer Price Index.) These adjustments have been huge for recent years of rapid general price inflation. In 1978, for example, nominal capital gains of \$106 billion were experienced on assets valued at \$713 billion on January 1. But general price inflation of 9.3 percent resulted in a purchasing power loss of \$67 billion on assets held (9.3 percent of \$713 billion) and a purchasing power gain of \$11 billion on debt owed (9.3 percent of \$119 billion).

Columns I through M of Table 2 show the final result, real capital gains. In most years, farm real estate has been the primary source of real capital gains or losses. The main exceptions have been years of large changes in the value of the cattle inventory, but, for this item, large losses (as in 1952 and 1974) have tended to be offset over time by large gains (as in 1958 and 1978). Farm debt has also become a significant source of real capital gains, partly because of its rapid growth, but mainly because of more rapid general price inflation.

Table 2. Computation of implicit real capital gains (billions of current dollars)

Year	Plus:								Equals:				
	Implicit nominal capital gains			Gain or loss from change in purchasing power of funds invested or owed					Implicit real capital gains				
	Total	Real estate	Other physical assets	Total	Real estate	Other physical assets	Finan- cial assets	Debt	Total	Real estate	Other physical assets	Finan- cial assets	Debt
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	
1950...	16	11	6	-11	-7	-4	-1	1	5	4	2	-1	1
1951...	12	8	4	-6	-4	-2	-1	1	6	4	2	-1	1
1952...	-5	1	-5	1	1	0	0	0	-4	1	-5	0	0
1953...	-6	-2	-4	0	0	0	0	0	-6	-2	-4	0	0
1954...	2	3	-1	-1	0	0	0	0	1	2	-1	0	0
1955...	3	4	-1	0	0	0	0	0	3	4	-1	0	0
1956...	10	7	2	-5	-3	-1	-1	1	5	4	1	-1	1
1957...	7	5	2	-4	-3	-1	0	0	3	2	1	0	0
1958...	14	8	5	-1	-1	0	0	0	13	8	5	0	0
1959...	3	5	-3	-1	-1	0	0	0	1	5	-3	0	0
1960...	1	1	0	-1	-1	0	0	0	0	0	0	0	0
1961...	8	6	2	-1	-1	0	0	0	6	5	1	0	0
1962...	7	6	2	-3	-2	-1	0	0	4	4	1	0	0
1963...	7	8	-1	-1	-1	0	0	0	6	8	-1	0	0
1964...	9	9	0	-5	-4	-1	0	1	4	5	-1	0	1
1965...	14	11	3	-4	-3	-1	0	1	10	8	2	0	1
1966...	12	9	3	-6	-5	-2	-1	1	7	4	2	-1	1
1967...	10	10	0	-6	-5	-2	-1	1	4	6	-2	-1	1
1968...	12	9	3	-10	-9	-3	-1	2	1	0	0	-1	2
1969...	10	5	5	-13	-11	-4	-1	3	-3	-6	1	-1	3
1970...	9	6	3	-10	-8	-3	-1	2	-1	-2	0	-1	2
1971...	20	15	5	-11	-9	-3	-1	2	9	6	2	-1	2
1972...	38	26	12	-14	-11	-4	-1	3	25	15	8	-1	3
1973...	76	58	18	-37	-30	-11	-3	7	39	28	7	-3	7
1974...	39	38	0	-61	-50	-18	-5	11	-23	-11	-18	-5	11
1975...	59	49	10	-29	-24	-8	-2	5	30	25	2	-2	5
1976...	74	67	7	-29	-25	-8	-2	5	45	42	0	-2	5
1977...	50	42	8	-38	-33	-9	-2	7	12	9	-2	-2	7
1978...	106	74	32	-56	-49	-14	-3	11	51	25	18	-3	11

In Chart 2, real capital gains are compared with net farm income. Positive real capital gains were experienced in most years of the past three decades.

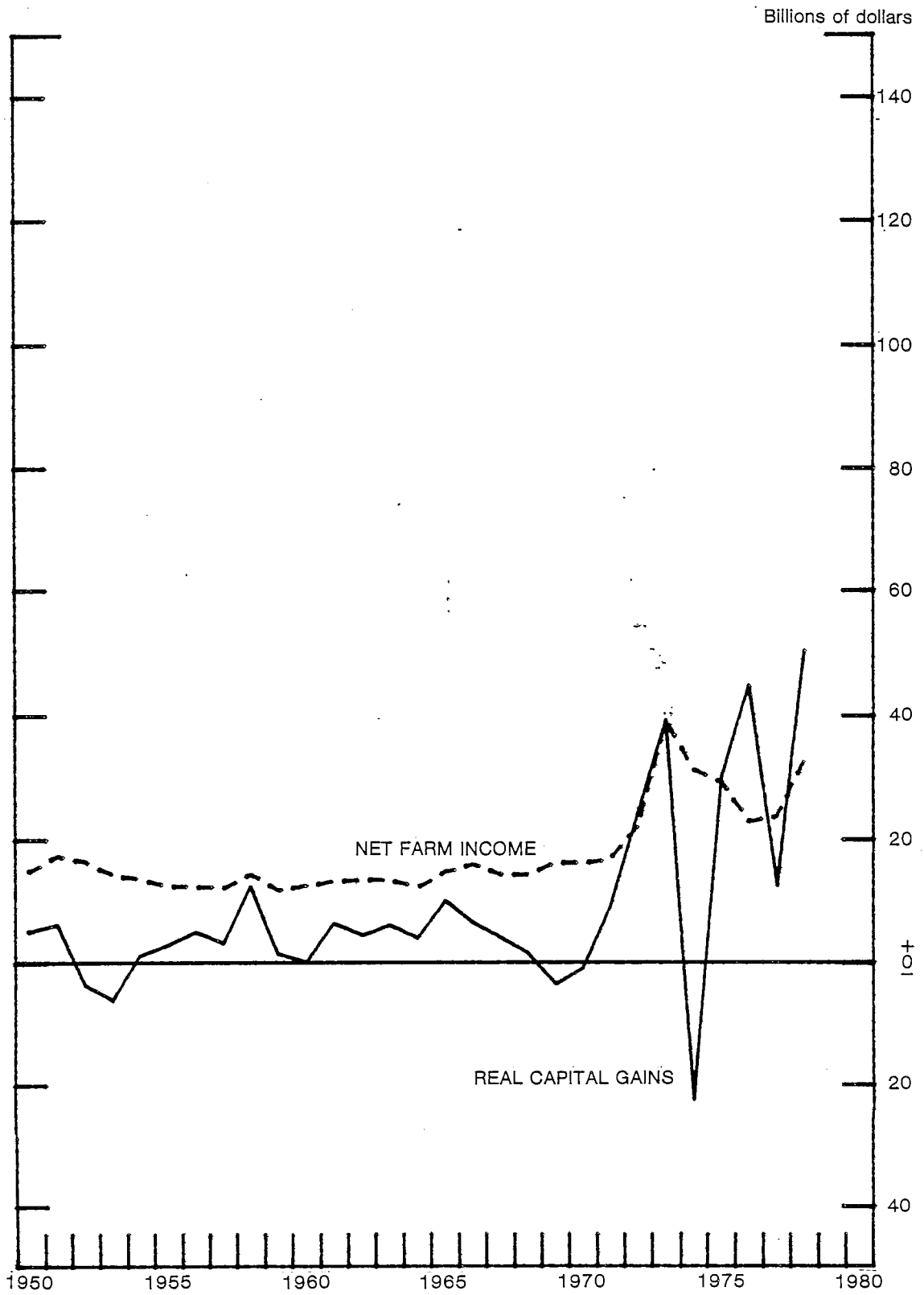
Table 3 compares income and capital gains in selected periods. Note that the ratio in Column A, which is based on nominal capital gains, is especially misleading during periods of rapid general price inflation. Column B indicates that, except for 1968-1970, significant amounts of real capital gains have been experienced since 1955.

Table 3. Capital gains compared with net farm income, selected periods

Period	Characteristics of period	Capital gains as a percentage of total net farm income	
		Nominal (A)	Real (B)
1940-45	World War II boom.....	61	17
1946-49	Aftermath of World War II boom.....	30	-14
1950-51	Korean War boom.....	90	36
1952-54	Aftermath of Korean War boom.....	-21	-20
1955-60	Farm cropland readjustment (reduction)...	50	33
1961-67	Farm cropland stabilized.....	68	43
1968-70	General price inflation.....	65	-6
1971-73	Farm boom, general inflation.....	171	93
1974-77	Farm recession, general inflation.....	204	56
1978	Farm recovery, general inflation.....	326	155

Chart 2

Real capital gains compared with net farm income



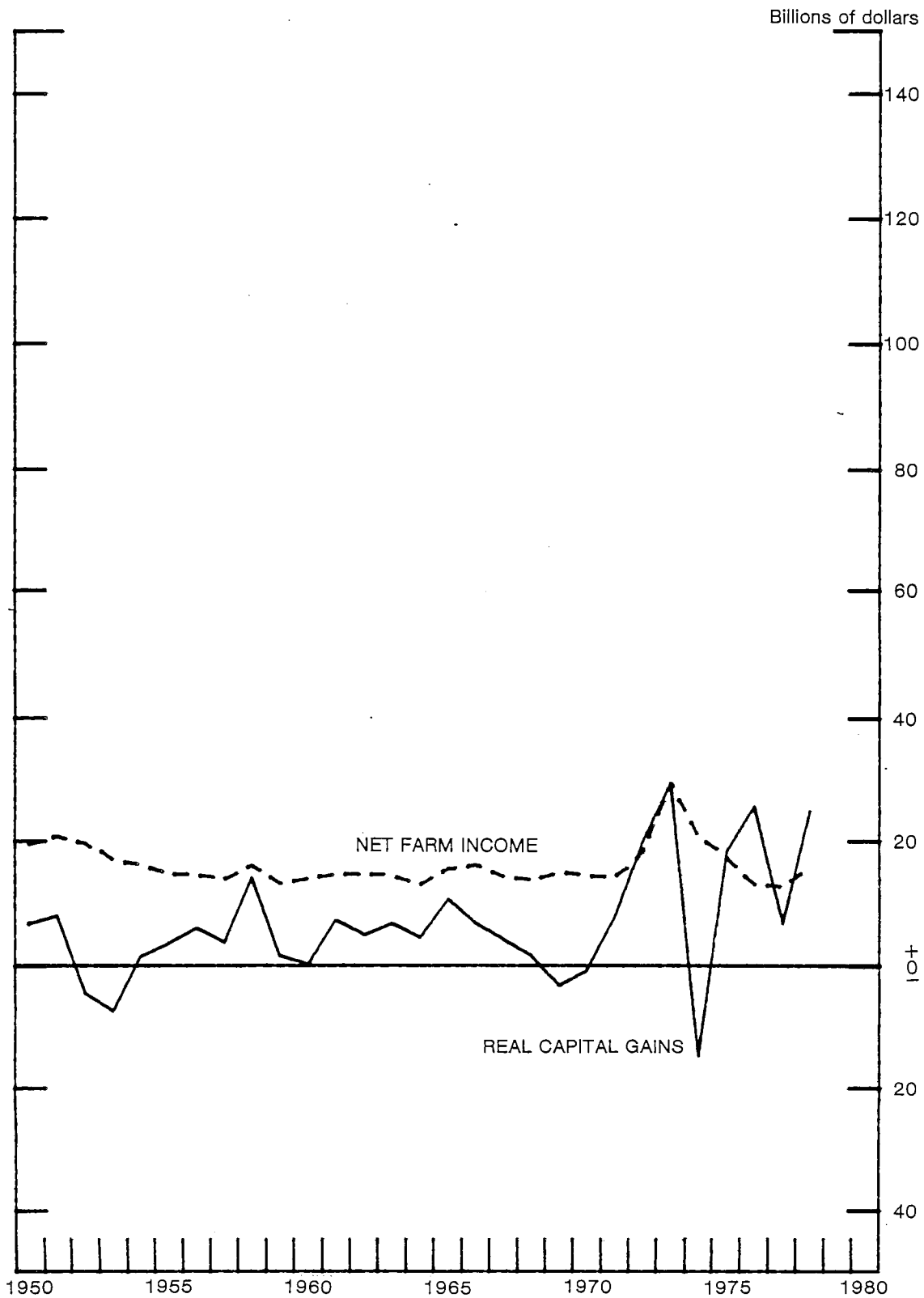
If one also wants to compare recent capital gains with those of earlier years (or, for that matter, recent income with that of earlier years) it is advisable, as is done in Chart 3, to express the data in terms of dollars with the same purchasing power. Even in constant dollars, recent real capital gains are on average significantly larger than in earlier periods.

Any multi-year comparison of income and capital gains (such as in Table 3) should also be computed from series in constant dollars, as otherwise the years in which prices are more inflated receive unwanted greater weight. Note, however, that in any given year the relationship between income and real capital gains is the same in current dollars (Chart 2) as in constant dollars (Chart 3).

Chart 3

Real capital gains compared with net farm income

1967 dollars



II. Origin of the real capital gains--the current return to assets

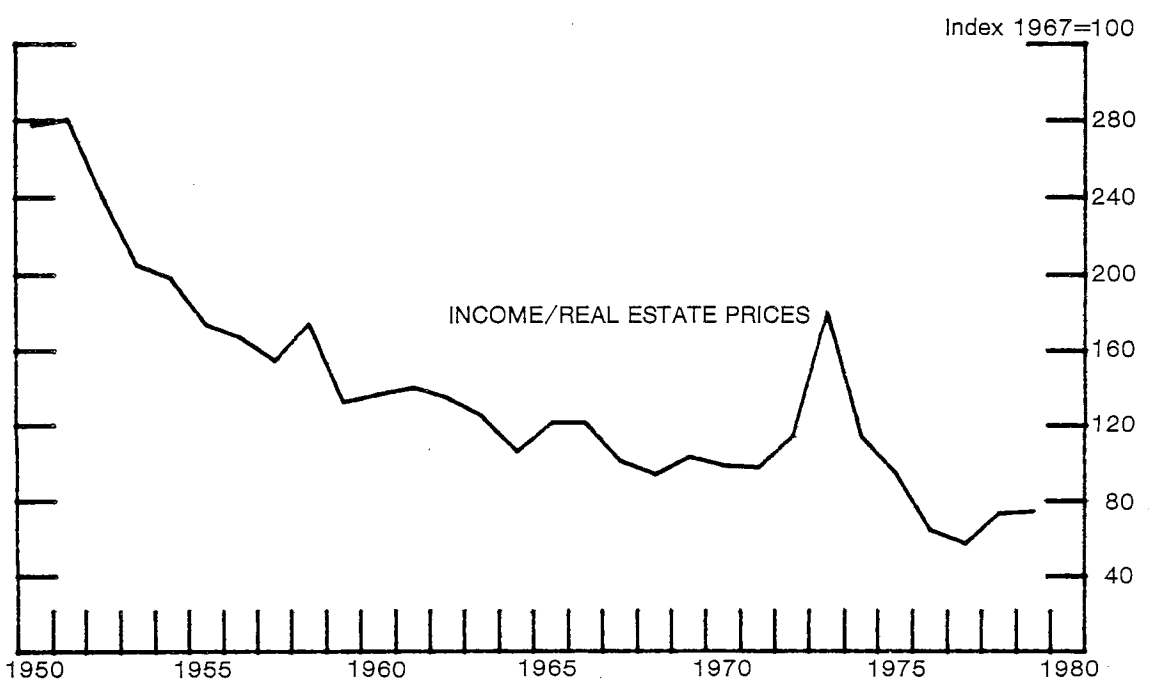
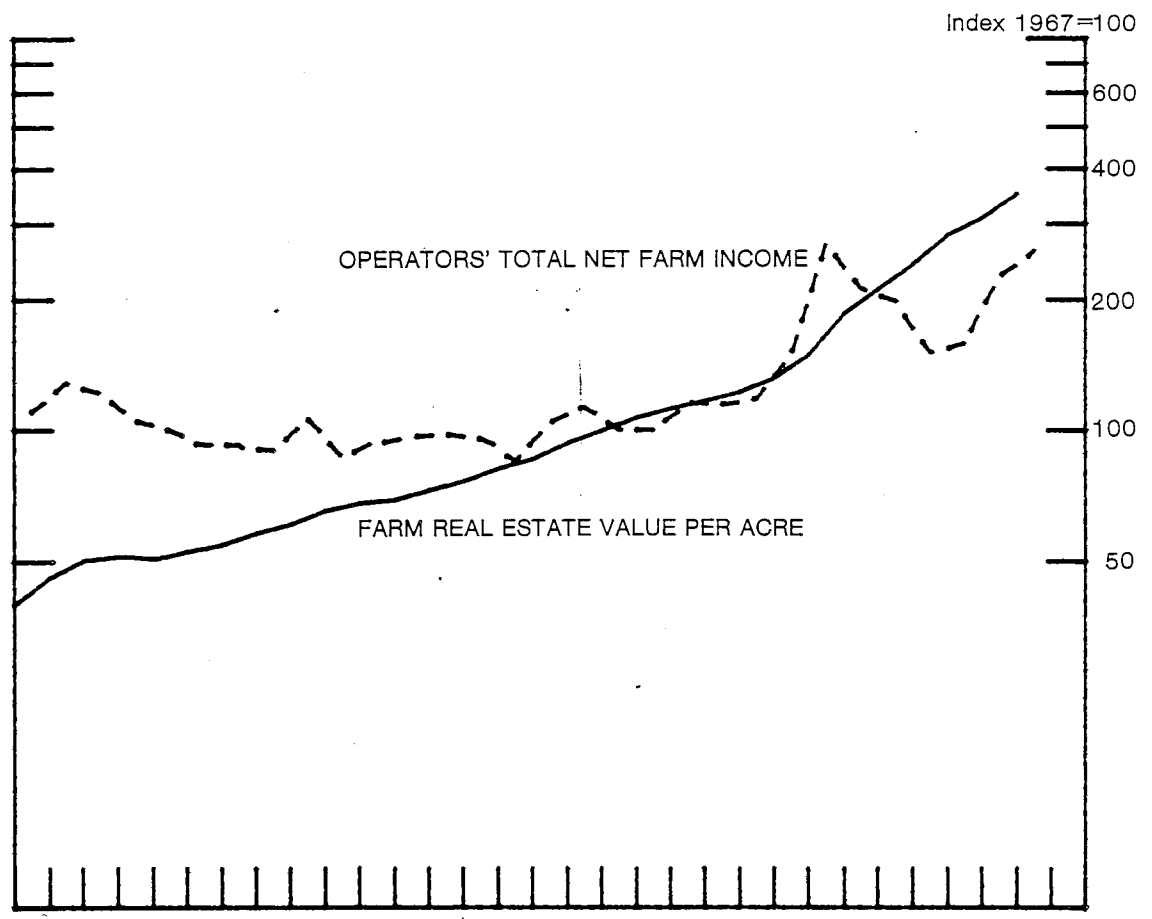
Many of the policy implications of large annual real capital gains depend on the cause of those gains. It is important to know, for instance, whether real capital gains are occurring because the return to assets is rising or because of some other influences.

In a farm policy seminar held last year, I pointed out that the real capital gains of the past 25 years have occurred primarily because the return to farm assets has been growing rapidly (Melichar 1978). The return to assets has, in fact, risen somewhat faster on average than either farm real estate prices or the total value of farm assets. The common impression of this relationship, however, remains exactly the opposite. Thus I repeat in this section the main reasoning and results of the earlier paper. The common impression is shown to be based on an inappropriate measure of the return to assets. When a more appropriate series is used, a much different conclusion emerges.

Typical discussions of land prices have proceeded by stating that, in theory, land prices should be related to "income." They then go on, as in Chart 4, to compare operators' net farm income with the USDA index of farm real estate value per acre. (To assist in comparing the relative trends of the two series, their ratio is plotted in the lower panel of the chart.) Obviously, land prices have tended to rise faster than operators' net income, especially prior to 1968. By that time this concept had become entrenched in much analytical thinking and literature.

Chart 4

Operators' net farm income compared with farm real estate prices



There are, however, important defects inherent in comparing operators' net farm income with land prices. To begin with, an aggregate return is being compared with a unit price; moreover, the aggregate income is being regarded as a return to real estate alone, ignoring other productive farm assets. These defects can be remedied by replacing the real estate price index with the aggregate USDA series called "farm production assets" (Evans, p. 15).

Furthermore, operators' net farm income is not an appropriate measure of the return to either land or production assets. Table 4 shows the derivation of a more appropriate series. First, because a significant portion of farm real estate is owned by nonoperator landlords, their net rental income is added. Interest paid on farm debt is also included, as the goal is a return to assets rather than to equity. And, since farm production assets exclude operators' dwellings, that part of operators' net farm income consisting of the imputed return to the equity in these dwellings is subtracted.

At this point, the series shown in column E of Table 4 has been derived. However, as its title indicates, this series remains a return not only to assets but also to management and to operators' labor. Thus, over time, comparisons between it and asset values may be distorted by changes in the relative importance of assets, management, and operators' labor in farm production. In view of the well-known reduction in operator numbers and man-hours, often described as "the substitution of capital for labor," one should not be surprised to find that this series is not an appropriate indicator of trends in the return to assets alone.

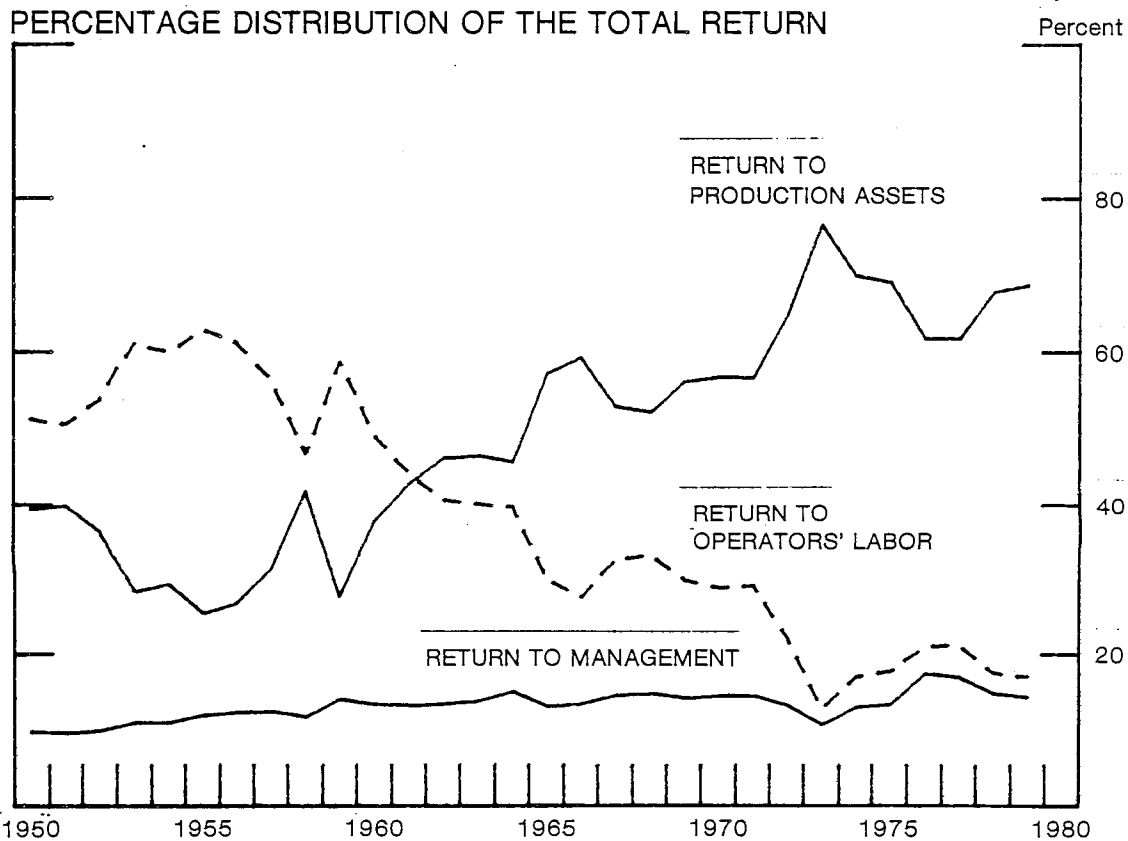
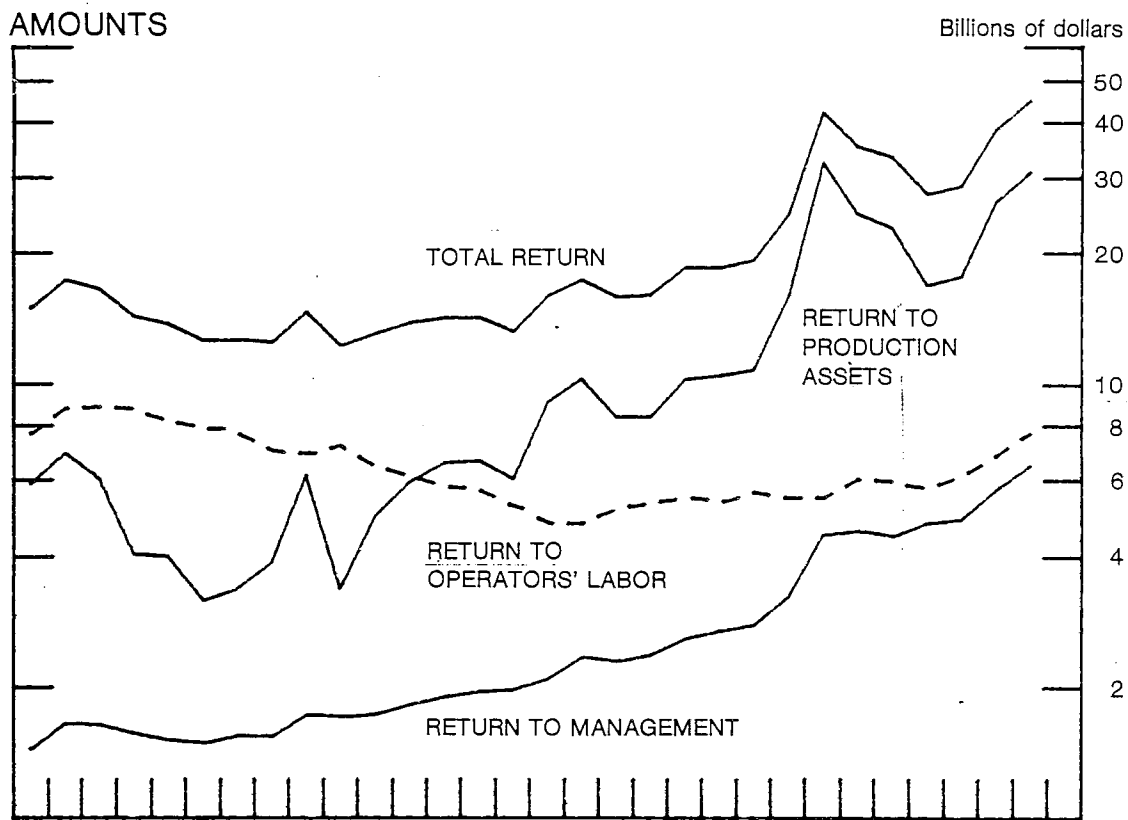
Table 4. Derivation of residual return to farm production assets, and percentage rate of return

Year	Operators' net farm income	Plus		Less	Equals	Less		Equals	Production assets (January 1)	Return as percentage of production assets
		Net rent	Interest on debt	Imputed return to equity in dwellings	Return to production assets, management, and operators' labor	Return imputed to--	Management	Operators' labor		
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
Billions of dollars										Per cent
1950...	13.6	1.2	.6	.5	14.9	1.4	7.6	5.9	95.0	6.2
1951...	15.9	1.4	.7	.6	17.4	1.7	8.8	6.9	111.3	6.2
1952...	15.0	1.4	.8	.7	16.5	1.6	8.9	6.0	123.6	4.8
1953...	13.0	1.2	.8	.7	14.3	1.6	8.7	4.0	120.5	3.3
1954...	12.4	1.2	.8	.6	13.7	1.5	8.2	4.0	117.1	3.4
1955...	11.3	1.1	.8	.7	12.6	1.5	7.9	3.2	118.8	2.7
1956...	11.3	1.1	.9	.6	12.6	1.5	7.7	3.4	122.7	2.7
1957...	11.1	1.0	1.0	.7	12.4	1.5	7.0	3.9	130.5	3.0
1958...	13.2	1.2	1.1	.7	14.7	1.7	6.9	6.1	138.3	4.4
1959...	10.7	1.1	1.2	.8	12.3	1.7	7.2	3.4	151.6	2.2
1960...	11.5	1.1	1.3	.9	13.1	1.7	6.4	4.9	162.8	3.0
1961...	12.0	1.3	1.4	.8	13.9	1.8	6.1	5.9	164.2	3.6
1962...	12.1	1.5	1.6	.9	14.2	1.9	5.8	6.6	171.1	3.8
1963...	11.8	1.6	1.8	.9	14.3	2.0	5.7	6.6	178.4	3.7
1964...	10.5	1.7	1.9	.9	13.2	2.0	5.2	6.0	185.6	3.2
1965...	12.9	1.9	2.1	.9	16.0	2.1	4.8	9.1	193.1	4.7
1966...	14.0	2.0	2.3	.9	17.4	2.3	4.8	10.3	208.9	4.9
1967...	12.3	1.9	2.6	1.0	15.8	2.3	5.2	8.4	221.3	3.8
1968...	12.3	2.0	2.8	1.0	16.1	2.4	5.3	8.4	233.4	3.6
1969...	14.3	2.1	3.1	1.1	18.3	2.6	5.5	10.3	245.3	4.2
1970...	14.2	2.1	3.4	1.1	18.5	2.7	5.3	10.5	256.3	4.1
1971...	14.6	2.2	3.6	1.2	19.3	2.8	5.6	10.9	265.5	4.1
1972...	18.7	3.5	3.8	1.3	24.7	3.3	5.4	16.1	286.7	5.6
1973...	33.3	5.7	4.7	1.5	42.2	4.5	5.4	32.3	322.7	10.0
1974...	26.1	5.1	5.7	1.8	35.1	4.6	6.0	24.6	394.5	6.2
1975...	24.5	4.6	6.3	2.2	33.2	4.5	5.9	22.8	425.4	5.4
1976...	18.7	4.2	7.0	2.5	27.4	4.8	5.7	16.9	483.2	3.5
1977...	19.8	4.1	8.0	3.1	28.7	4.9	6.1	17.7	549.9	3.2
1978...	27.9	4.7	9.4	3.2	38.8	5.7	6.8	26.3	596.1	4.4
1979...	32.0	5.2	11.6	3.7	45.1	6.5	7.7	30.9	682.3	4.5

Chart 5 shows the decomposition, as estimated by the USDA (Evans, p. 16), of the total return that was derived in column E of Table 4. The upper panel shows the three component amounts, which sum to the total return which is also charted. The lower panel, which shows the percentage distribution each year of the same three components, helps to clarify the significant change that occurred. Over the last 25 years, the proportion of the total return that could appropriately be ascribed to operators' labor has dropped from 63 percent to 17 percent, while the proportion that could be regarded as a return to production assets has risen from 25 percent to 69 percent. Consequently, as shown in the upper panel of the chart, the estimated return to farm production assets has risen very rapidly over this period.

Chart 5

Distribution of the total return to production assets, management, and operators' labor



1950 1955 1960 1965 1970 1975 1980

The last three columns in Table 4 show the residual return to farm production assets, the value of these assets, and the rate of current return to such assets. When these three series are plotted in Chart 6, it becomes evident that a markedly different picture of relative trends in asset values and returns has emerged. Since the mid-1950's, the return to farm production assets has risen faster than the value of such assets. Thus the rate of return rose from an average of 3.0 percent in 1955-1959 to 4.2 percent in 1965-1969, and again averaged 4.2 percent in 1975-1979 in spite of the slump in 1976 and 1977.

Given the growth exhibited by the return to assets and the dominant position of farm real estate among these assets, there is no question but that farm real estate prices had to rise significantly. Chart 7 provides a rough demonstration of this effect. It shows hypothetical values for the return to assets if farm real estate prices are held at their 1954 level while all other data take on the values actually experienced. While this is an untenable assumption and therefore the results should not be regarded as simulation estimates, they do help to indicate that rapid growth of the return to assets exerted significant upward pressure on real estate prices.

Table 5 shows the results of similar analytical exercises for all years since 1950. As one views, in this table, the steady upward climb in the rate of return on original cost after purchase of a representative bundle of U.S. farm assets in almost any year of the last three decades, it becomes obvious that growth in the return has played a prominent role in land price increases and hence in the occurrence of real capital gains. The arithmetic of this relationship is the next topic.

Chart 6

Residual return to farm production assets compared with value of such assets

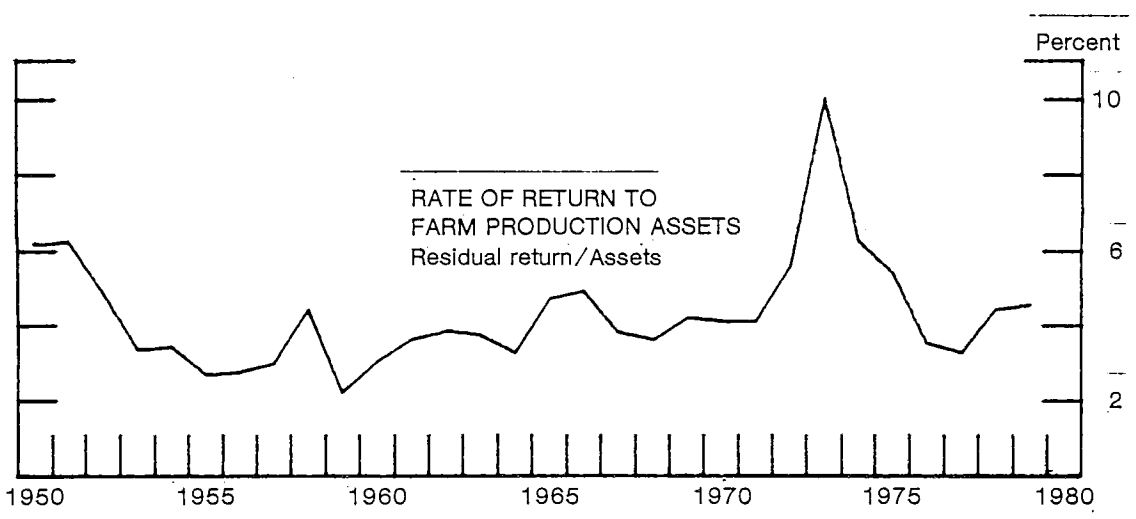
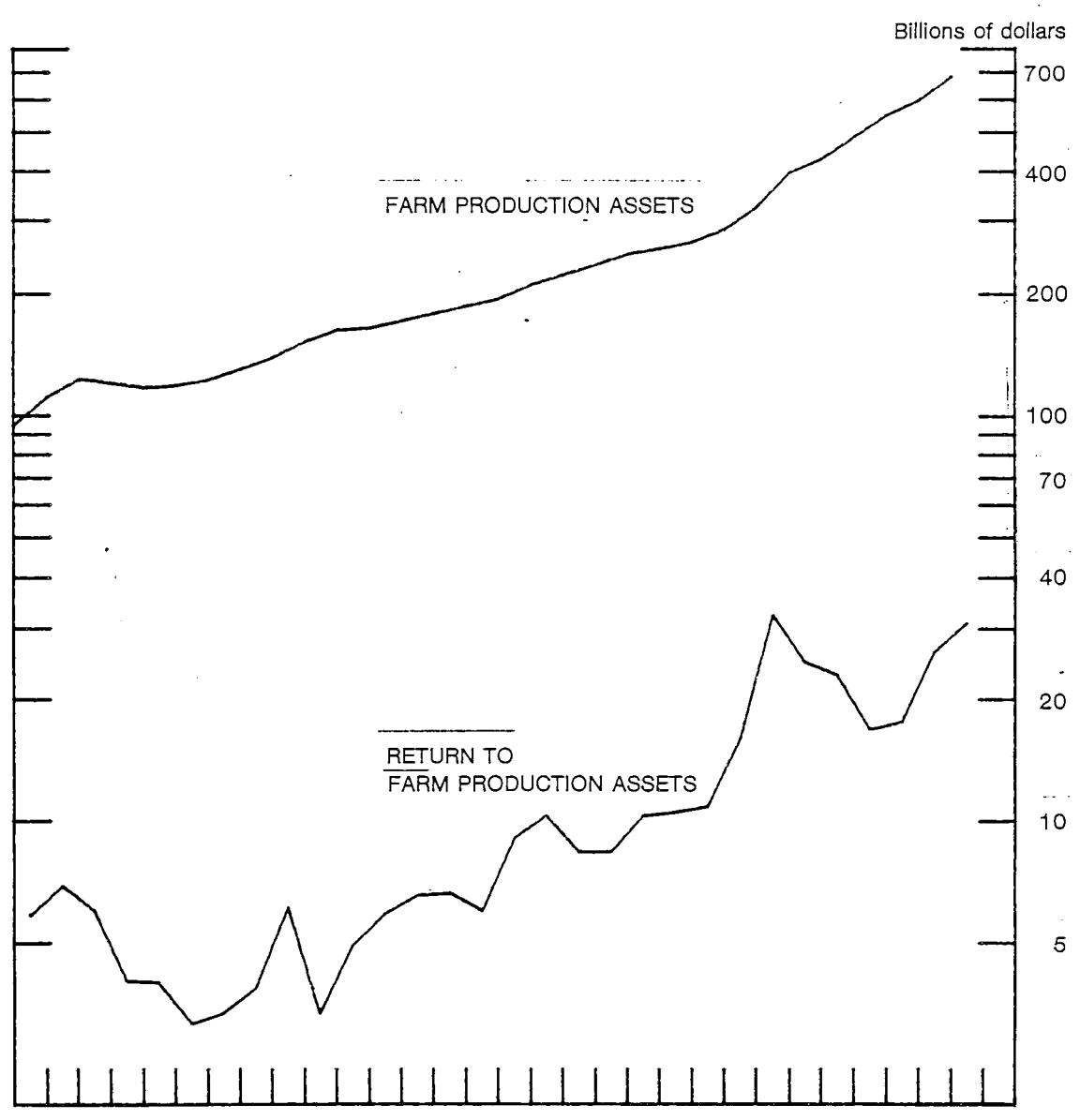


Chart 7

Comparison of rates of return to farm asset values that exclude or include capital gains on real estate since 1954

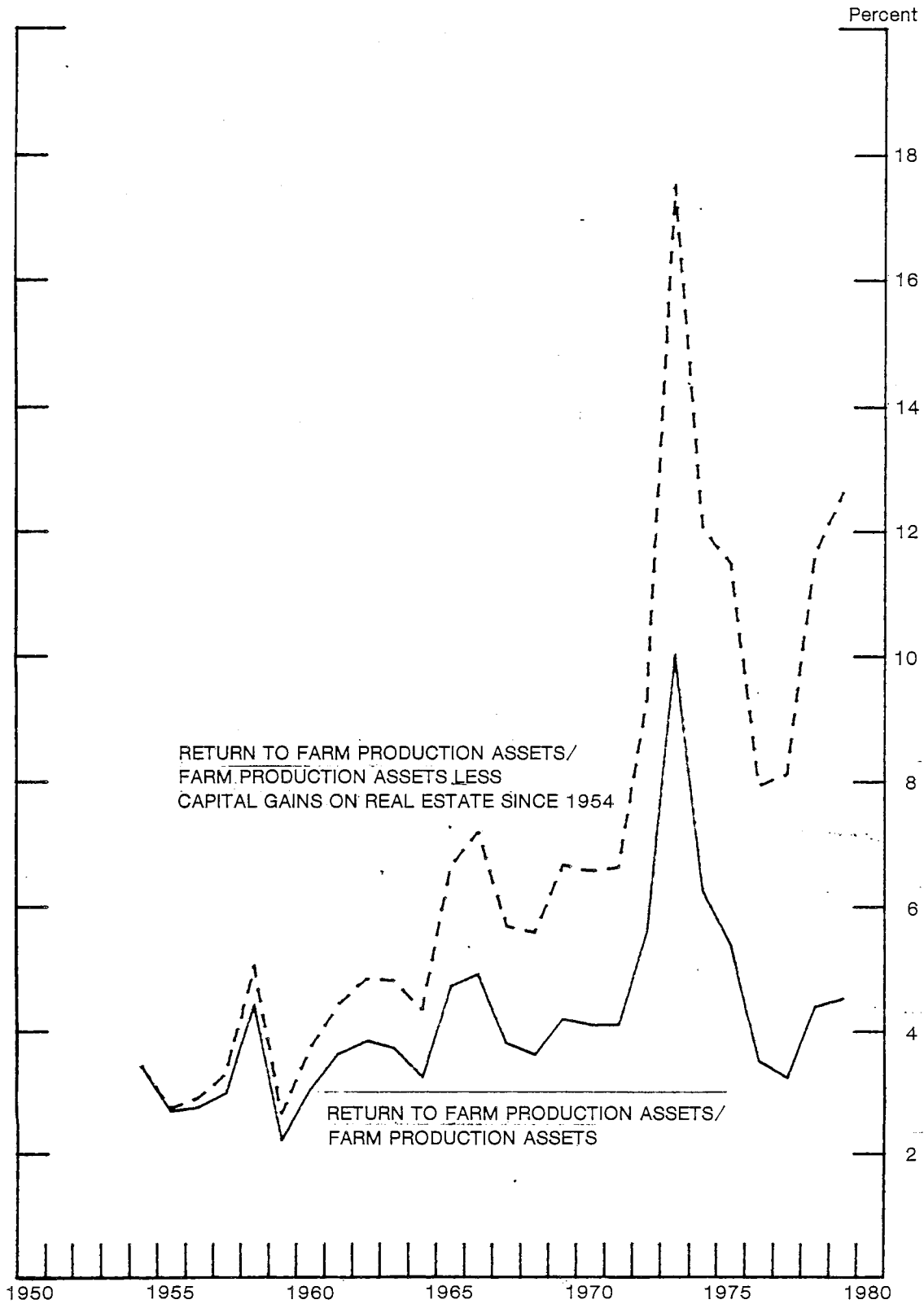


Table 5. Rate of return to farm production assets that exclude capital gains on real estate since the year specified

Year	Specified year (year of real estate "purchase")																													
	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
	<u>Per cent</u>																													
1950...	6																													
1951...	7	6																												
1952...	6	5	5																											
1953...	4	4	3	3																										
1954...	4	4	3	3	3																									
1955...	3	3	3	3	3	3																								
1956...	3	3	3	3	3	3	3																							
1957...	4	3	3	3	3	3	3	3																						
1958...	6	5	5	5	5	5	5	5	4																					
1959...	3	3	3	3	3	3	3	2	2	2																				
1960...	4	4	4	4	4	4	4	3	3	3	3																			
1961...	5	5	4	4	4	4	4	4	4	4	4	4																		
1962...	5	5	5	5	5	5	5	4	4	4	4	4	4																	
1963...	5	5	5	5	5	5	5	4	4	4	4	4	4	4																
1964...	5	5	4	4	4	4	4	4	4	4	4	4	3	3	3															
1965...	7	7	7	7	7	7	6	6	6	6	5	5	5	5	5	5														
1966...	8	7	7	7	7	7	7	7	6	6	6	6	6	6	5	5	5													
1967...	6	6	6	6	6	6	5	5	5	5	5	5	5	4	4	4	4	4												
1968...	6	6	6	5	6	5	5	5	5	5	5	5	5	4	4	4	4	4	4											
1969...	7	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	5	4	4									
1970...	7	7	6	6	7	6	6	6	6	6	6	6	5	5	5	5	5	4	4	4	4									
1971...	7	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	5	5	4	4	4	4	4							
1972...	10	10	9	9	9	9	9	9	9	8	8	8	8	8	7	7	7	7	6	6	6	6	6	6						
1973...	19	18	17	17	18	17	17	16	16	15	15	15	15	14	14	13	13	13	12	12	12	11	11	10						
1974...	13	12	12	12	12	12	12	11	11	11	11	10	10	10	10	9	9	9	9	9	8	8	8	8	7	6				
1975...	12	12	11	11	11	11	11	11	11	10	10	10	10	10	9	9	9	8	8	8	8	8	7	7	6	5				
1976...	9	8	8	8	8	8	8	8	7	7	7	7	7	7	6	6	6	6	6	6	5	5	5	5	4	4	3			
1977...	9	8	8	8	8	8	8	8	8	7	7	7	7	7	6	6	6	6	6	6	6	5	5	4	4	4	3			
1978...	12	12	12	12	12	12	11	11	11	10	10	10	10	10	10	9	9	9	9	8	8	8	8	7	6	6	5	4		
1979...	13	13	13	13	13	13	12	12	12	12	11	11	11	11	11	10	10	10	9	9	9	9	9	8	7	7	6	5	5	5

III. Theoretical and empirical relationships among current return, capital gains, and assets

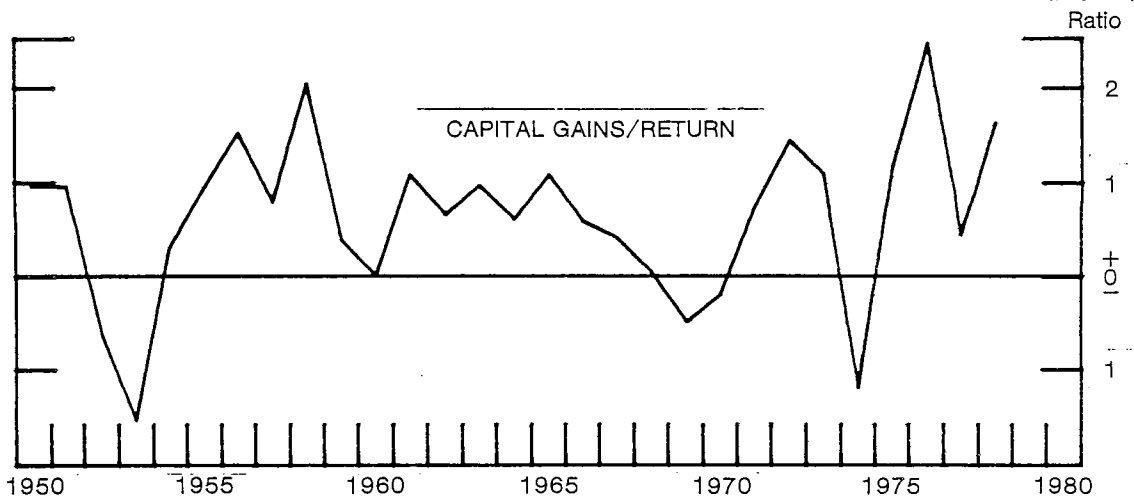
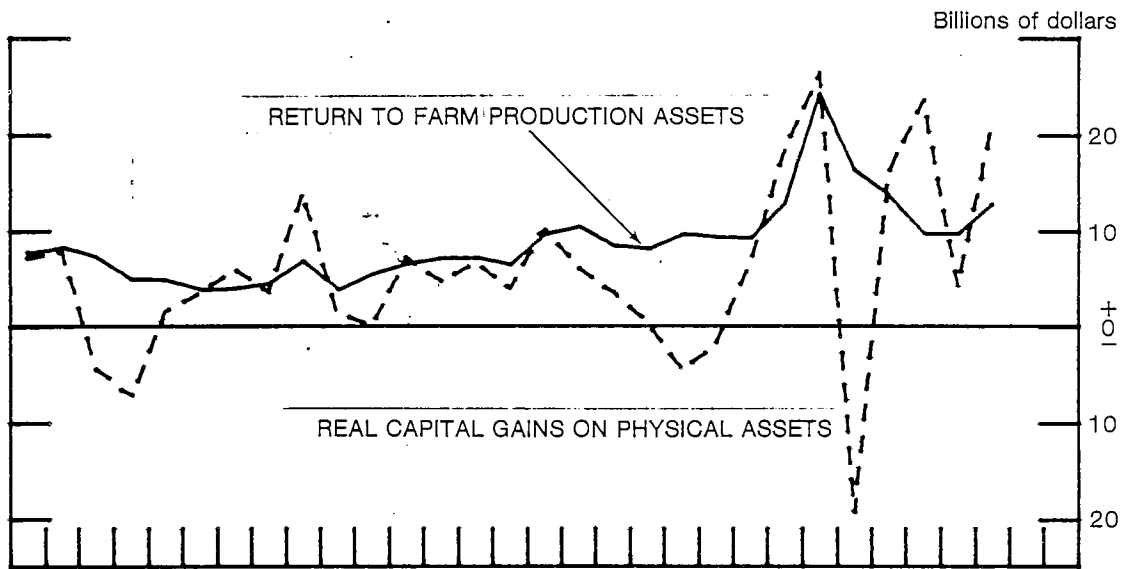
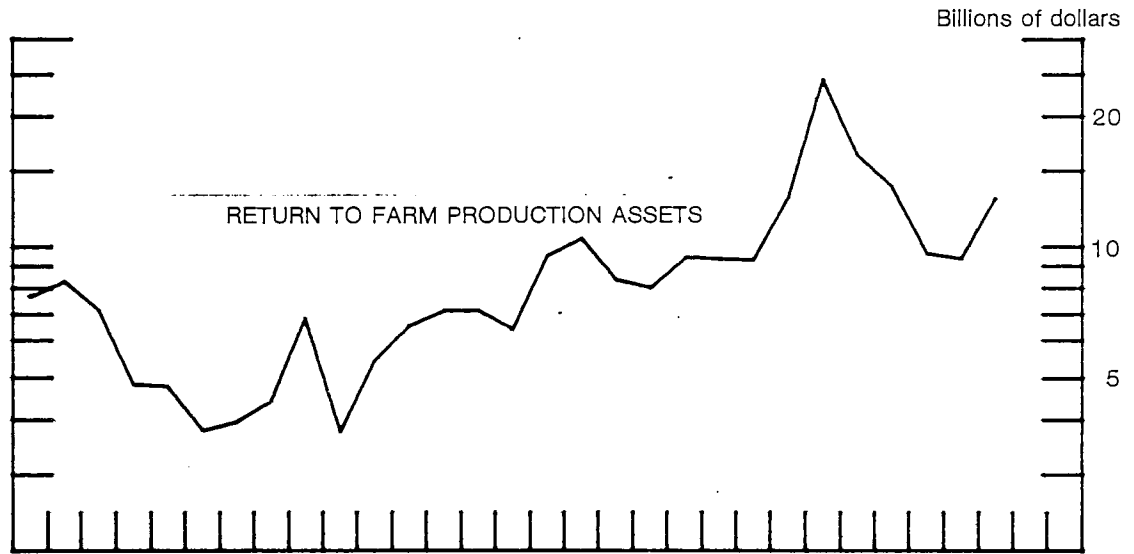
Key results of the first two parts of this paper are brought together in Chart 8. The top panel demonstrates that the constant-dollar current return to farm assets has exhibited significant growth since the mid-1950's. Its annual growth rate over the period 1954-1978 averaged 4.25 percent.

In the middle panel of Chart 8, the annual real capital gains on physical assets that were computed in columns J and K of Table 2 are compared with the annual current return to production assets. In discussing real capital gains as a form of return to assets, it is more meaningful to compare them with the current return to assets than with total net income which, as already shown, contained a much greater proportion of labor income in earlier than in more recent years. Note that real capital gains on physical assets were on average nearly as large as the current return from 1954 through 1967 as well as in the 1970's. This picture is confirmed by the last panel of the chart, which shows the ratio of capital gains to the current return.

Chart 8

Return to assets compared with real capital gains

1967 dollars



In Table 6, average values of these data are shown for four periods into which the past 25 years have been divided on the basis of differences either in the growth rate of the current return, shown in column A, or in the relative importance of real capital gains, shown in column C. In addition, column B shows the average rate of current return, and column D shows a measure of the average annual real percentage change in farm real estate prices.

Table 6. Summary of historical constant-dollar relationships among current return, capital gains, and asset values, for selected periods

Period	Average annual growth rate of current return to production assets (per cent)	Average annual rate of current return to production assets (per cent)	Average annual real capital gains on physical assets as percentage of current return	Average annual real capital gains on real estate as percentage of real estate assets
	(A)	(B)	(C)	(D)
1954-60...	2.4	3.1	91	3.1
1961-67...	6.2*	4.0	76	3.5
1968-71...	2.3*	4.0	2	-2
1972-78...	5.0*	5.4	91	4.9

* Growth rate from return in year preceding period shown to return in last year of period.

For insights into the historical experience and relationships summarized in Table 6, it is instructive to examine parallel relationships inherent in the asset-pricing model for an asset with a growing return. In its simplest form (ignoring complications such as inflation and taxes), the formula that relates the equilibrium present value of such an asset to its return is:

$$\begin{aligned}
 V &= \frac{1+g}{1+d} R + \frac{1+g}{1+d} V \\
 &= \frac{1+g}{d-g} R
 \end{aligned}$$

where V is the present value of the asset,
 R is the present current return,
 g is the annual growth rate of the current return, and
 d is the discount rate applied to future returns.

For this asset, real capital gains arise in two different ways. First, changes in the value of R , g , or d result in a new equilibrium value V , and the amount of change in V is a real capital gain. Second, if the growth rate g is greater than zero, the equilibrium value V rises each year even though the values of g and d are unchanged; that is, annual real capital gains are an inherent feature of the equilibrium condition.

Table 7 helps to illustrate the first source of real capital gains. For instance, at a discount rate of 6 percent, the table shows that an asset whose return is growing at a rate of 1 percent annually will tend to be priced at 20.20 times its current return. If the growth rate of the return rises to 2 percent, the equilibrium multiple rises to 25.50. Thus this change in the underlying conditions causes equilibrium asset value to rise by 5.30 times a single year's current return. If the asset market should recognize and "discount" this growth rate change within one year, the real capital gain recorded that year would dwarf current income in that year. Suppose, however, that the asset market were to take 5 years to become fully aware of this growth rate change. In each of these years, the ongoing revaluation of the asset would on average result in real capital gain roughly equal to the current return. In the sixth year, the new equilibrium asset value having been reached, real capital gains from this source would vanish. This could come as a shock to analysts who had projected future gains primarily on the basis of the past record of such gains.

Revaluations of this kind are always going on in asset markets. In any historical record of real capital gains, an unknown proportion consists of gains of this essentially temporary and reversible nature.

Table 7. Equilibrium constant-dollar asset value at various growth and discount rates

Annual growth rate of current return to assets (per cent)	Discount rate applied to future returns (required rate of return to assets) (per cent)											
	1	2	3	4	5	6	7	8	9	10	11	12
Equilibrium asset value per \$1.00 of current return (dollars)												
0.....	100.00	50.00	33.33	25.00	20.00	16.67	14.29	12.50	11.11	10.00	9.09	8.33
1.....	101.00	50.50	33.67	25.25	20.20	16.83	14.43	12.62	11.22	10.10	9.18	
2.....		102.00	51.00	34.00	25.50	20.40	17.00	14.57	12.75	11.33	10.20	
3.....			103.00	51.50	34.33	25.75	20.60	17.17	14.71	12.88	11.44	
4.....				104.00	52.00	34.67	26.00	20.80	17.33	14.86	13.00	
5.....					105.00	52.50	35.00	26.25	21.00	17.50	15.00	
6.....						106.00	53.00	35.33	26.50	21.20	17.67	
7.....							107.00	53.50	35.67	26.75	21.40	

Table 8 helps to clarify the second kind of real capital gains, those that occur annually in an equilibrium situation.

Panel A of Table 8 shows that, at equilibrium, the annual rate of increase in the price of an asset is equal to the growth rate of the annual return. The logic of this result is readily apparent. For instance, if the equilibrium price of an asset this year is 25.50 times earnings and those earnings are rising by 2 percent annually, then next year, when those earnings are 2 percent higher, the asset is again priced at 25.50 times earnings and thus its price is also 2 percent higher. Therefore the value of the asset grows at the same rate as its return.

Panel B shows the equilibrium rate of current return at various combinations of the growth and discount rates. Note that the sum of the rate of current return (in Panel B) and the rate of capital gains (in Panel A) is equal to the discount rate. But since the growth rate is the same as the rate of capital gains, it is also evident that the rate of current return is equal to the discount rate minus the growth rate. In other words, the discount rate determines the total rate of return, and the growth rate determines how that total return is divided between a capital gain and a current return.

Suppose that one has an asset whose current return is growing at 2 percent annually, and that the discount rate of participants in the market for that asset is 6 percent. Panel B shows that the asset will be priced to yield an annual current return of 4 percent. For this asset, therefore, the ratio of annual capital gains to current return will be $2/4$; that is, each year capital gains will be equal to 50 percent of current income. This result, shown in Panel C, is simply the figure in Panel A expressed as a percentage of the corresponding figure in Panel B.

Table 8. Selected aspects of the equilibrium constant-dollar relationship among current return, capital gain, and asset value

Annual growth rate of current return to assets (per cent)	Discount rate applied to future returns (required rate of return to assets) (per cent)											
	1	2	3	4	5	6	7	8	9	10	11	12
<u>A. Annual capital gain as a percentage of asset value</u>												
0.....	0	0	0	0	0	0	0	0	0	0	0	0
1.....		1	1	1	1	1	1	1	1	1	1	1
2.....			2	2	2	2	2	2	2	2	2	2
3.....				3	3	3	3	3	3	3	3	3
4.....					4	4	4	4	4	4	4	4
5.....						5	5	5	5	5	5	5
6.....							6	6	6	6	6	6
7.....								7	7	7	7	7
<u>B. Annual current return as a percentage of asset value</u>												
0.....	1	2	3	4	5	6	7	8	9	10	11	12
1.....		1	2	3	4	5	6	7	8	9	10	11
2.....			1	2	3	4	5	6	7	8	9	10
3.....				1	2	3	4	5	6	7	8	9
4.....					1	2	3	4	5	6	7	8
5.....						1	2	3	4	5	6	7
6.....							1	2	3	4	5	6
7.....								1	2	3	4	5
<u>C. Annual capital gain as a percentage of annual current return</u>												
0.....	0	0	0	0	0	0	0	0	0	0	0	0
1.....		100	50	33	25	20	17	14	12	11	10	9
2.....			200	100	67	50	40	33	29	25	22	20
3.....				300	150	100	75	60	50	43	38	33
4.....					400	200	133	100	80	67	57	50
5.....						500	250	167	125	100	83	71
6.....							600	300	200	150	120	100
7.....								700	350	233	175	140

Upon scanning Panel C, it becomes evident that substantial annual capital gains are inherent in equilibrium situations characterized by growth rates such as those recorded in Table 6. In returning to Table 6 to make such a comparison of historical and equilibrium capital gains, it would be futile to assume and misleading to imply that any past period represented equilibrium. But the comparison does show that the substantial real capital gains experienced over most of the past 25 years--no matter what their origin--were on the whole no greater than those that would have been expected to occur at equilibrium, given the growth rates exhibited by the current return to production assets.

At equilibrium, the percentage that the growth rate in column A of Table 6 is of the rate of return in column B would be equal to the percentage in column C. The actual relative amount of capital gains shown in column C is slightly above such an equilibrium level in the 1950's, considerably below it during the next two periods, and about equal to it during 1972-1978.

Alternatively, at equilibrium, the percentage gains in column D of Table 6 would be equal to the growth rates in column A. Again, the historical gains were slightly higher in the 1950's, much lower in the 1960's, and about the same in the 1970's.

It thus appears that both recent real capital gains and those of 1954-1967 are, in a sense, fully explained by the growth exhibited by the current return to assets. Changes in other land market influences, such as nonfarm demand and the discount rate, therefore appear to have largely offset one another.

IV. Implications for agricultural structure and policy

The foregoing rates and relationships have serious implications for the structure of the farming sector and for public farm policy. Given a growth rate of 4 to 5 percent in the constant-dollar current return to assets, the farming sector is doomed, at likely discount rates, to a relatively low rate of current return on the market value of assets. This inescapable consequence is the common root of many of the farming sector's current problems: cash flow difficulties, large increases in debt, troubles of beginning farmers, the attraction of farm real estate for persons of large wealth or high income--all of these stem from the fact that, at such a growth rate, a significant proportion of the total return to farm real estate necessarily takes the form of real capital gains. To borrow the language of the stock market, farm real estate is a "growth stock," best and most easily owned by those who can tolerate its low current return in the first few years after its purchase.

In attempting to respond to cash flow problems and the like, it might appear logical to take policy actions that increase the growth rate of the current return. However, the principal longer-term effect of programs that maintain or increase the growth rate is not on the profitability of farming, but rather on the degree to which profit takes the form of capital gains rather than current return. Policy actions that increase the growth rate will tend to depress the rate of current return to assets, and thus the problems they seek to address are eventually aggravated. The implications of capitalization of an increased growth rate in income are therefore more severe than those of the well-known "capitalization of an increase in income."

A low current return to the market value of assets is not a problem for all farmers. Established farmers, like wealthy stockholders, thrive on the growing and eventually high rates of return on the funds they invested in earlier years. But persons of limited means find it difficult to undertake investments with a low initial current return--or may find themselves in financial difficulty shortly after doing so. In the interests of preserving or promoting certain characteristics of the structure of farming, it may be considered desirable to assist these persons in making or in surviving such investments. It is evident that such aid should be provided in ways that do not tend to increase further the growth rate of the current return in farming generally; otherwise, a few years later new entrants are likely to face still lower rates of current return.

There are parallel implications for other aspects of farm policy. Designers of farm programs should bear in mind that, over time, the rate of current return to assets is inversely related to the growth rate of that return. Thus, for instance, programs to reduce the short-run variability of income may need to truncate peaks as well as troughs of farm output prices and to adjust constant-dollar commodity support levels downward as productivity advances; otherwise, their unintended long-term effect may be to reduce the rate of current return.

More generally, farm land price research needs to be re-examined in the context of the foregoing framework. Among the variables popular in recent models, "net farm income" seems clearly inappropriate, while the role and interpretation of "expected capital gains" and perhaps also "current yields on alternative investments" need to be reconsidered. The present rate of current return (and thus the present level of land

prices) appears implicitly indicative of expectations that the constant-dollar return to assets will grow at an average annual rate of perhaps 5% over a lengthy future period. Earlier studies have indicated that technological advances in combination with government commodity programs that maintained output prices were instrumental in establishing a growing real return to assets (Brake and Melichar, p. 442). In this decade, increased foreign demand in concert with government programs appears to have been the primary factor maintaining or increasing the growth rate of that return. Renewed study of these relationships should further advance understanding of past and probable future land price trends.

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