FACTOR MIX IN THE SAES RESEARCH SYSTEM

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Factor Mix in the SAES Research System

1. Introduction:

The University of Minnesota has initiated a series of studies concerning the U.S. Public Sector Agricultural Research System which has involved a major reconstruction of the state-level data on research expenditure, research personnel etc. Preliminary checks indicated that the data sets commonly used to date contained some construction flaws which were serious enough to warrant this reconstruction effort.[1] The task is nearing completion and affords us the chance to undertake some detailed analytical work on the changing nature of the agricultural output-agricultural research expenditure relationship.

However, the data also offers us a rather unique opportunity to quantify some of the structural or institutional characteristics of the various state systems and observe the 'statistical' evolution of these systems over their nearly 100 year history.

We hope the use of a consistently compiled and relatively 'clean' data set will minimize the errors in variables problems which can blur the informational content of such long data series. By collecting U.S. data in a panel context (i.e. cross sectional (state-level) -time series data) we can ask of it many policy related questions concerning the impact of research on agricultural output, extension-research linkages, transfer issues and what-have-you, unencombered by the many measurement problems which accompany international panel data sets. While we are well aware that the findings based on U.S. data cannot directly be extrapolated to an international context we hope these studies, and the accompanying data, can be used to establish some reliable empirical benchmarks against which to evaluate and compare similar research efforts based on other data sets which may be less extensive and somewhat more noisy.

In particular, the length of this current data set, yearly observations stretching back to 1890, affords us a rare opportunity to study the diversity and relatively slow evolution of 48 related, but administratively separate, agricultural research systems from their inception to maturity.

The state systems had their legislative origins in the Hatch Act of 1887 although it should be remembered that at the institutional level they operate in conjunction with the land grant universities which formally date back to the Morrill Act of 1862. We look at the experiment station system today and often lose sight of the fact that it evolved from quite humble beginnings. For instance, averaging the figures on full and part-time, state-level, research workers for the 1890-1895 period we observe two thirds of the 48 contiguous states employed less than 10 research workers in total while the two largest state systems of California and New York had only 19 and 24 researchers respectively. Fifty years later, averaging over the 1940-45 period, the total number of experiment station researchers had increased just over 10 fold from 440 to around 4650. Nevertheless, a significant number of the state systems, 21 percent in fact, still employed less than 10 full and part-time research workers while a further 22 states (46 percent of the sample) employed between 50 and 100 scientists. The two largest states, again New York and California, by this time employed 270 and 285 scientists respectively. The states systems continued to grow so that by the mid 1970's they employed approximately 11,250 scientists in total. The smallest state system was Vermont with 57 scientists and California was clearly the largest with 794 researchers. The number of states with less than 100 researchers had declined to 17 percent, with a further 15 states (31 percent) employing between one to two hundred scientists.

2. Factor Ratios:

Turning to the 'structural' research variables which form the focus of this discussion, Figure 1 presents details of the aggregate factor ratio's for the State Agricultural Experiment Stations from 1931 to 1975.[2] 1931 is the first year we were able to separate non-capital expenditure into its research labor and operating expense components. The latter category includes expenditures on items such as heat, light, chemicals, seed, fertilizer, publications and other sundry supplies. Here, as in the rest of the data the total capital figure includes expenditures on land, buildings and equipment.[3]

Over this nearly 45 year period the figures indicate a remarkable degree of stability in these aggregate factor ratios. Capital expenses average around 10.2 percent of total expenses, (which in turn can be broken down to 3.7% land and buildings and 6.5 percent equipment), operating expenses around 21.3 percent and labor expenses around 68.5 percent. However this apparent stability can be quite misleading. Figure 2 shows various factor ratios for the more extended period 1975 back to 1890. Unfortunately, for the pre 1931 period it is not possible to separate out labor and operating expenses but it is possible to break total expenditures down into its total capital (i.e. equipment plus land and building) and non-capital components. We observe, even at the aggregate level, that the factor ratio pattern for the earlier years is quite different than for the more recent past.

Indeed two quite distinct phases, namely an Establishment or Set-up Phase and an Equilibrium or Steady-State phase are suggested by the data. Excepting the two to three years after the passing of the Hatch Act we observe during the Establishment phase a gradual increase in the proportion of total expenditures going to capital rather than non-capital items. This trend peaked in 1912, some twenty three years after the formal establishment of the experiment station system when around 32 percent land and buildings, 9 percent equipment) of total expenditures went to capital goods. In relative terms, capital expenditures have exhibited a gradual decline since then, to the point that over the last 5 years in our sample, 1971 to 1975, they account for only 8 percent of total research expenditures, with 5.2 percent going to equipment and 2.8 percent to land and buildings expenditure respectively.

These long run shifts using aggregate data mask the even more dramatic variability and shifts in factor mix at the state level. Figure 3 presents frequency distributions which summarize the large variation between states in the proportion of total expenses going to labour and shifts in this pattern over the period 1931 to 1970. Looking first at the 1931 figures we observe the modal expenditure of labor as a percent of total expenses is in the 65 to 70 percent range. However several states spent less than 50 percent of their financial resources in that year on labor while 6 stations spent at the 75 to 80 percent level. The 1970 distribution reflects the shift towards a more labor intensive research system than was evident in the aggregate figures discussed earlier, where 12 states now spend in excess of 75 percent of their annual budgets on labor resources compared with only 6 states in 1931. Although the modal labour expenditure ratio is in the 65 to 70 percent range there is still a great deal of variability in this spending pattern between the states.

However, Figure 4 shows that despite the evidence presented to date of an overall increase in the proportion of total expenditures going to labor during the post Establishment phase of the experiment stations, this does not imply that each and every station has experienced such a shift. Here we plot the labor expenditure ratio for each station during 1931 against the same figure for 1970. Those states below the 45 degree line have experienced an increase in their labor ratio over this nearly 40 year period while those above the line have experienced a decline. Clearly these shifts at the state level are somewhat of a mixed bag, with roughly equal numbers of states experiencing increases and decreases in their labor expenditure ratios.

Qualitatively, the results presented for operating costs as a percent of total expenditure in Figures 5 and 6 are similar to the labor ratios we have just discussed. The frequency distributions of Figure 5 indicate a modal operating expense ratio in the 20 to 25 percent range for both periods and although we observe a 'rightward' shift in the frequency distribution between 1931 and 1970 the plot on Figure 6 indicates once again that this increasing operating expense ratio has not occurred uniformly across all states - around 43 percent of the states have, in relative terms, reduced their operating cost expenditures over this period.

The across state and over time pattern for the capital ratio however is quite different from the labor and operating expense ratios. Figure 7 shows a 'leftward' shift in the frequency distribution for capital ratios over the 1931-70 period with an associated decline in the modal value from the 7.5 to 10 percent range down to the 5 to 7.5 percent range. Notice also that in 1931, 48 percent of the sample were spending in excess of 7.5 percent of their total expenditures on capital (i.e. land, buildings, and equipment items) while in 1971 this had dropped sharply down to 31 percent of the sample. Moreover, Figure 8 suggests that the decline in relative capital outlays has been a feature of the institutional evolution of a significant proportion of the experiment stations. Nearly two thirds of the stations lie above the 45 degree line indicating a decline in capital costs as a percent of total expenditures.

Of course this decline in the relative importance of capital in the annual budgets of most experiment stations does not necessarily imply an absolute decline in capital expenditures. As a comparison of Figures 9 and 10 indicates, there has been a long run upward trend in real and nominal aggregate capital spending on agricultural research by the experiment stations until 1967, after which nominal capital spending stalled so that real spending declined. It is the faster rate of growth in non-capital spending which has contributed to the somewhat erratic but gradual increase in the aggregate non-capital/capital expenditure ratio in the post Establishment phase as plotted in Figure 11. Figure 12 indicates that the price of non-capital relative to capital research goods is generally lower in the more recent years compared to the earlier (especially pre 1920's) years. Standard production theory would suggest that changes in relative prices would induce shifts in relative factor mixes. A simple regression of the non-capital/capital expenditure ratio on the non-capital/capital price ratio yielded a loose (R^2 = .07) but statistically significant relationship which supports the notion that these public sector research institutions have responded in a manner which is consistent with our expectations - i.e. at the aggregate level at least they have substituted non-capital for capital research inputs as the relative price of capital goods has increased. We will return to these issues a little later.

3. <u>Research Spending Per Full-Time Equivalent</u>:

For now a quick look at these spending levels, normalized on the number of Full-Time Equivalent researchers at each experiment station will serve to round out this descriptive overview of the changing pattern of factor mixes at the station level.

Parenthetically, I should mention that the Full-Time Equivalent (FTE) figures used here are a more accurate measure of the research component of experiment station personnel than the full and part-time research worker figures used in a more general context earlier in this presentation. As you can see from Figure 13, generally less than 50 percent of the research personnel at the experiment stations hold full-time research appointments. A significant and increasing proportion of experiment station staff hold joint research-teaching appointments while a much smaller proportion hold joint research-extension appointments. This reflects the intimate relationship between the state experiment stations and the land grant colleges which is a characteristic feature of the U.S. public-sector agricultural research system at the state level.

Figures 14 and 15 reveal quite dramatically the different nature of the early Establishment years from those that followed. We observe in Figure 14 that for the first 20 years or so real capital spending per FTE averaged approximately 6760 (constant 1967) dollars, dropping quite precipitously around 1915 and remaining at this relatively low level thereafter.[4] In fact for the last 20 years in our sample real capital spending per scientist averaged only 2370 dollars.

Conversely Figure 15 shows that real non-capital spending declined during the early years and in contrast to capital spending has grown erratically but steadily since. The result is that real non-capital spending averaged only 13,000 dollars per FTE during the first twenty years and around 23,100 dollars for the last twenty.

However, like the earlier factor ratio figures these national averages tell only part of the story. Figures 16 through 19 plot frequency distributions across states for capital and non-capital figures averaged for both the 1891 to 1911 and 1954 to 74 periods. Real capital spending per FTE ranged across states from 2500 to 19,100 dollars per year in the earlier years with 30 of the 48 states spending in excess of 5,000 dollars per FTE. The range contracts quite sharply in the more recent past to average between 1150 and 5500 dollars with only 2 states now spending in excess of 5000 dollars per scientist on capital items.

Consistent with our earlier results the frequency distribution for non-capital spending per FTE shifted 'rightwards' over time so that modal spending doubled from around 12 to approximately 24,000 dollars per year. During the 1891 to 1911 period only 11 states spent in excess of 15,000 real dollars per FTE on non-capital goods and services while in the 1954 to 74 period all states spent in excess of this 15,000 figure.

4. Decomposing the Variation in Factor Mixes - Some Early Findings:

Clearly there are significant differences between states in their per FTE spending patterns when moving from the Establishment to the post-Establishment phase of institutional formation and growth. As a preliminary attempt to decompose some of this variability we regressed several structural variables on the capital and non-capital/FTE ratios. I should stress that no causal relationship between these regressors and the spending variables is necessarily implied - this is just a straightforward attempt to help summarize and describe the extremely large and variable data set we have at our disposal.

A summary table of the regression variables is included in the Appendix. It shows the near doubling in average non-capital spending per FTE and a reduction by a factor of two thirds in capital spending per FTE between the earlier and later time periods.

The size variable points to a substantial although, as pointed out earlier quite uneven increase in the size of each state's agricultural research institution as indexed by the average number of full-time equivalent researchers. The FTR variable describes the substantial decline in the number of full-time researchers relative to the total researcher population - 46.4 percent held full-time researcher appointments during the establishment years while on average only 33.8 percent are full-time in the last 21 years of the sample. (In fact for 1974 alone the proportion had fallen to only 27 percent). Finally, as we would anticipate, there has been a substantial decline in the growth rate of the experiment stations down to an average of 1.3 percent per annum from an establishment level of 13.2 percent. In fact 11 states experienced a contraction in the number of FTE researchers during the 1954-74 period.

A large degree of the variability in the capital, non-capital spending figures was captured by these structural-type variables. A quick overview of the results points to several generalities. It appears that relatively larger research systems are associated with higher non-capital expenditures per researcher and perhaps lower capital spending per researcher. This relationship would follow if larger stations employed more skillful and therefore relatively costly researchers. Conversely smaller stations, who find it more difficult to attract and retain more skillful researches, may attempt to substitute physical for human capital. Those systems which grow rapidly spend relatively more per scientist on capital inputs and possibly less on non-capital inputs. This result would be consistent with the observation that there is often a ballooning of capital expenditures associated with increasing staff levels as increased building and equipment expenditures are needed to support them. Of course, using service flows rather than capital expenditures would likely dampen this observed relationship. Finally, higher proportions of full-time researchers are associated with lower capital and non-capital expenditures per FTE. This finding suggests that the non-research functions of the SAES-Land Grant institutions may be subsidizing the full-time researchers in the system.

Including time dummy variables to capture unobservable time related effects and regional dummy variables to capture unobservable location specific effects does not qualitatively alter these generalities. They do confirm a 'statistically' significant drop in capital spending and rise in non-capital spending between the two periods, possibly reflecting the (intertemporal) influence of the relative price effect noted earlier at the federal level.[5] However, there is no clear suggestion that unobservable regional influences effect these per researcher spending patterns, implying that state-level relative price effects may not be measurably important.

These findings should definitely be considered preliminary. We are currently quantifying other state-level structural variables such as the degree of fragmentation of these state systems, differences in researcher training as proxied by Ph.D. ratios and differences in the research portfolio (i.e. livestock, plant and basic researcher mix) which may well influence these capital - non-capital spending patterns. We hope to be able to report these figures in the not too distant future.

Nevertheless the results to date do suggest that different institutional structures have a measurable impact on the spending patterns of public sector research institutions. With these additional variables we hope to provide some of the empirical benchmarks relating to the factor mixes associated with agricultural research endeavors which hitherto have been unavailable.

5. Summary:

This brief look at the long run spending patterns of public sector agricultural research institutions reveals significant shifts over time in the factor mix at the aggregate level coupled with a substantial degree of variability at the state level.

Factor ratios and per scientist spending figures reveal an Establishment phase lasting some twenty to twenty five years when the spending pattern was significantly different compared with the years which followed. The Establishment phase was characterized by a relatively low non-capital/capital expenditure ratio (in fact this ratio declined during this period) and relatedly relatively high capital per FTE and declining non-capital/FTE figures. In contrast, the post-Establishment phase was characterized by a gradual but somewhat erratic increase in the non-capital/capital spending ratio; a relatively constant real capital/FTE figure; and a gradual increase in the real non-capital/FTE figure.

We also found that a relatively small set of institutional-type variables such as station size, percent of full-time researchers and average yearly growth rates captured roughly two thirds of the intertemporal and interstate variability in the state-level spending/FTE ratios. The specifics of these findings, while tentative, are plausible. They show an analysis of aggregate trends, needs to be supplemented with these structural details, in order to provide an informative perspective of the institutional development which characterized the public agricultural research system in the U.S.

Footnotes

1 Most of the state-level U.S. figures used by previous researchers have in part on completely relied on figures compiled from Cooperative State Research Service (CSRS) sources by Latimer (1966).

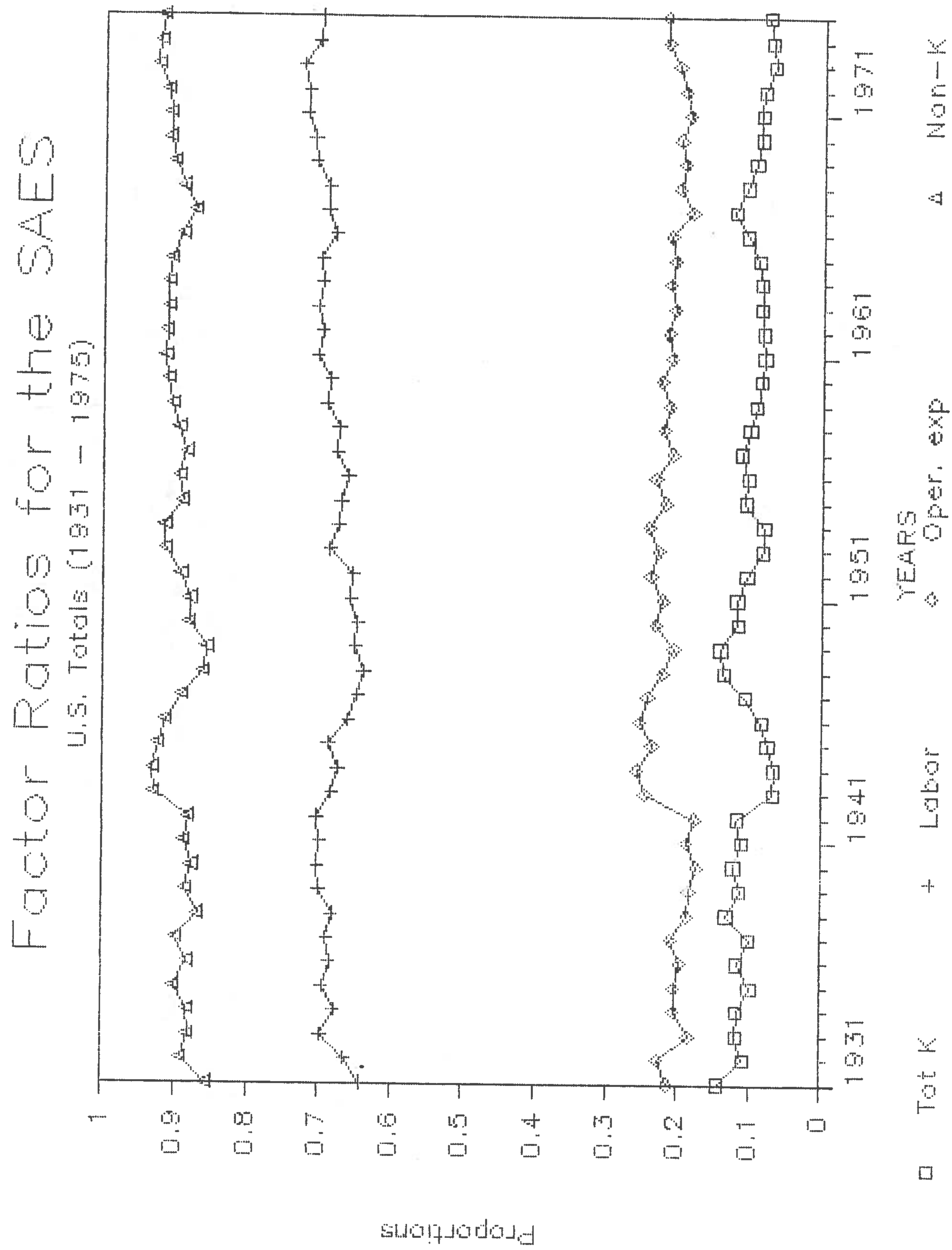
2 All expenditure series presented in this paper terminate in 1975. In 1966 the USDA began development of its Current Research Information System (CRIS) which in 1976 replaced the previous CSRS annual reports of spending (from both federal and nonfederal funds available) by the SAES. The CSRS system consisted of figures reported on a state basis while the CRIS system compiles SAES figures reported on a research project or problem area basis. We have not yet resolved the inconsistencies which this change in reporting systems has introduced into the spending series.

3 The expenditure figures in this paper have been constructed using a variety or formulae.

4 All expenditure figures are expressed in constant 1967 dollars. Labor and Non-capital expenditures were deflated with a price index based on the average salaries paid to university professors; equipment expenditures were deflated with a series based on the prices paid for state and local goods and services; and land and building expenditures were deflated with a series based on the Handy-Whitman building cost index. Labor and non-capital expenditures can be inflated to a 1980 base if multiplied by 2.08.

5 We are currently unaware of the existence of any acceptable research factor price indices at the state-level, particularly for expenditures in the earlier years.

FIGURE 1


Factor Ratios for the SAES
U.S. Totals (1931 - 1975)
Proportions
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1931
1941
1951
1961
1971
YEARS
□ Tot K
+ Labor
◇ Oper. exp
△ Non-K

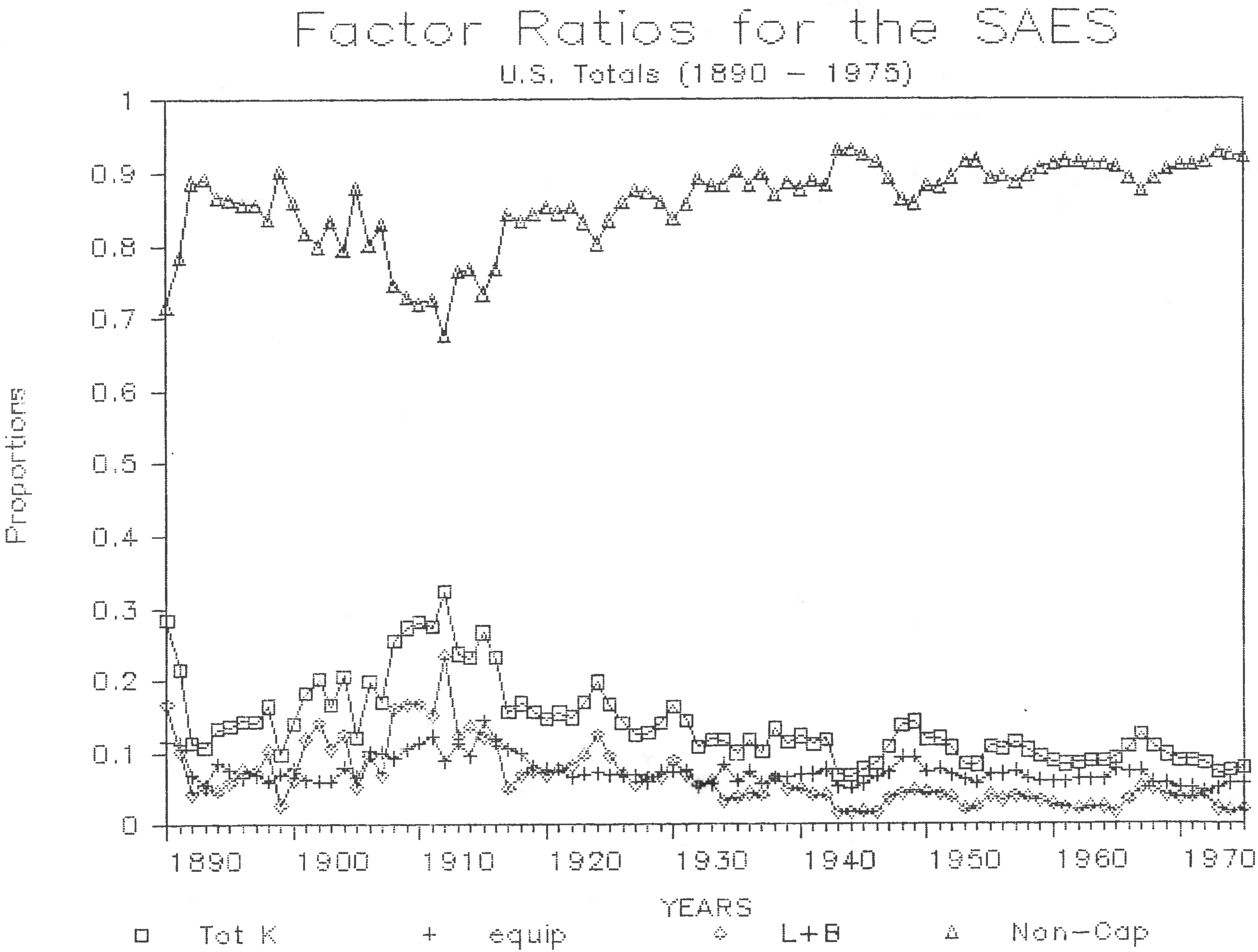
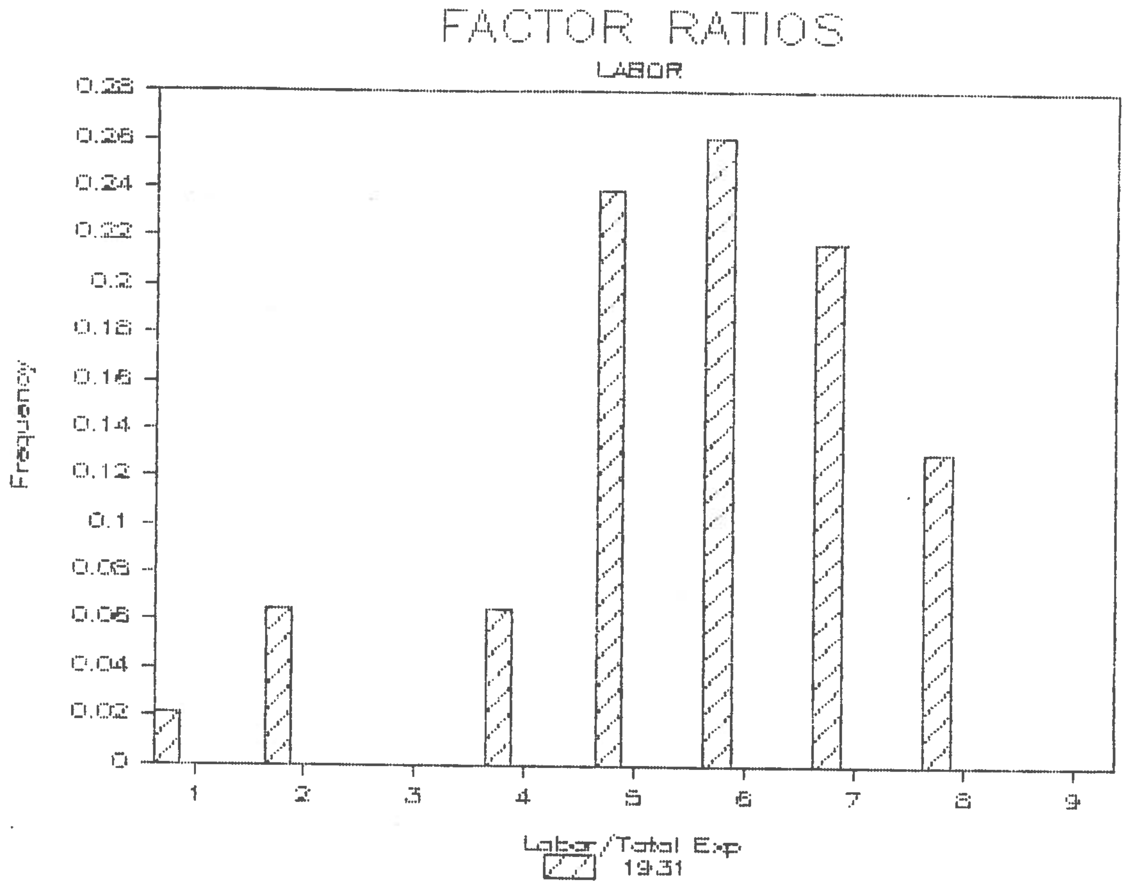

Factor Ratios for the SAES
U.S. Totals (1890 - 1975)
Proportions
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1890
1900
1910
1920
1930
1940
1950
1960
1970
YEARS
□ Tot K
+ equip
◇ L+B
△ Non-Cap

FIGURE 3



1 : <.45
2 : .45 - .50
3 : .50 - .55
4 : .55 - .60
5 : .60 - .65
6 : .65 - .70
7 : .70 - .75
8 : .75 - .80
9 : >.80

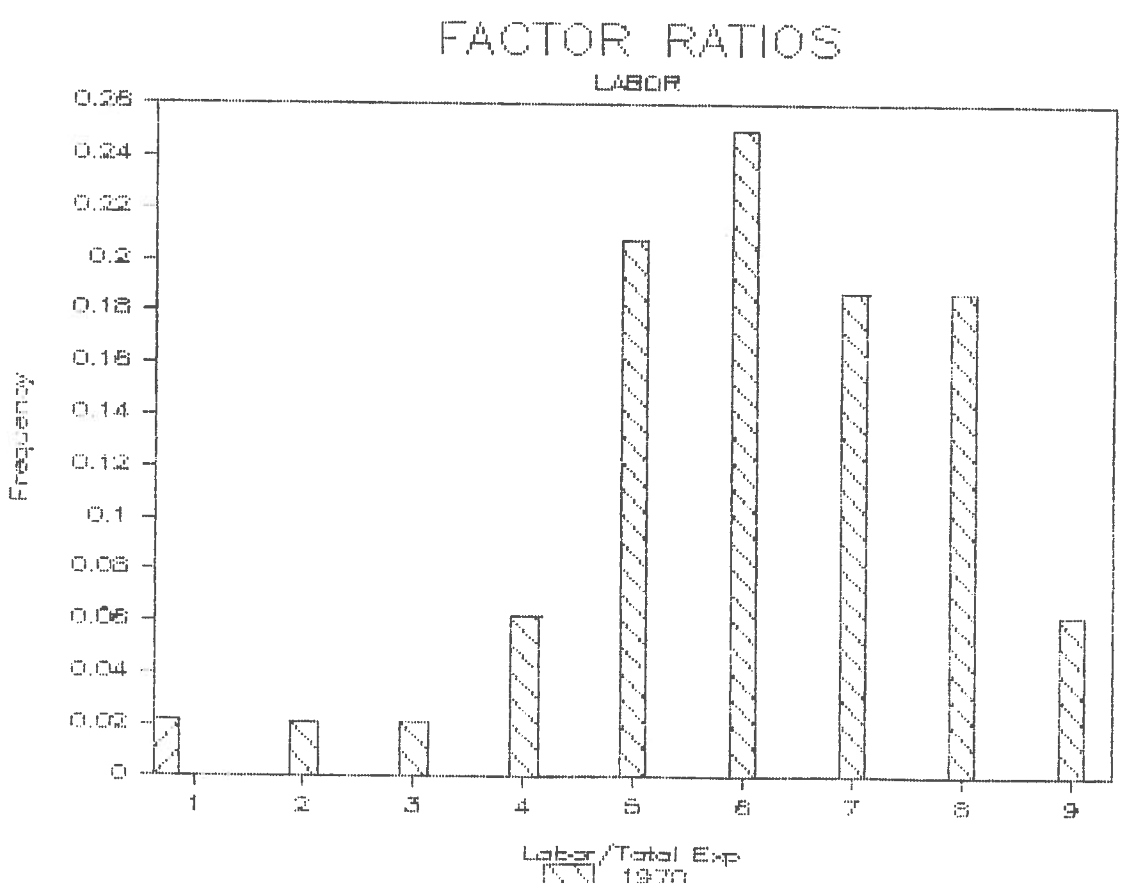
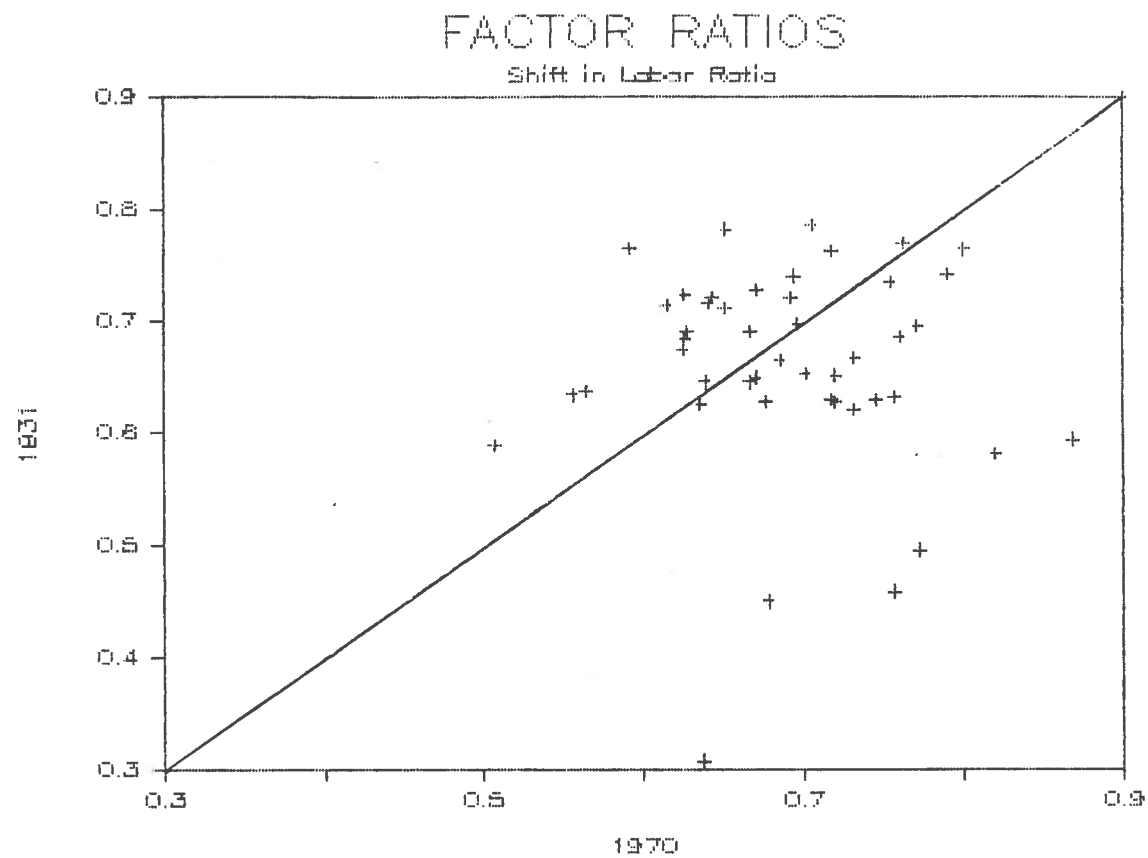
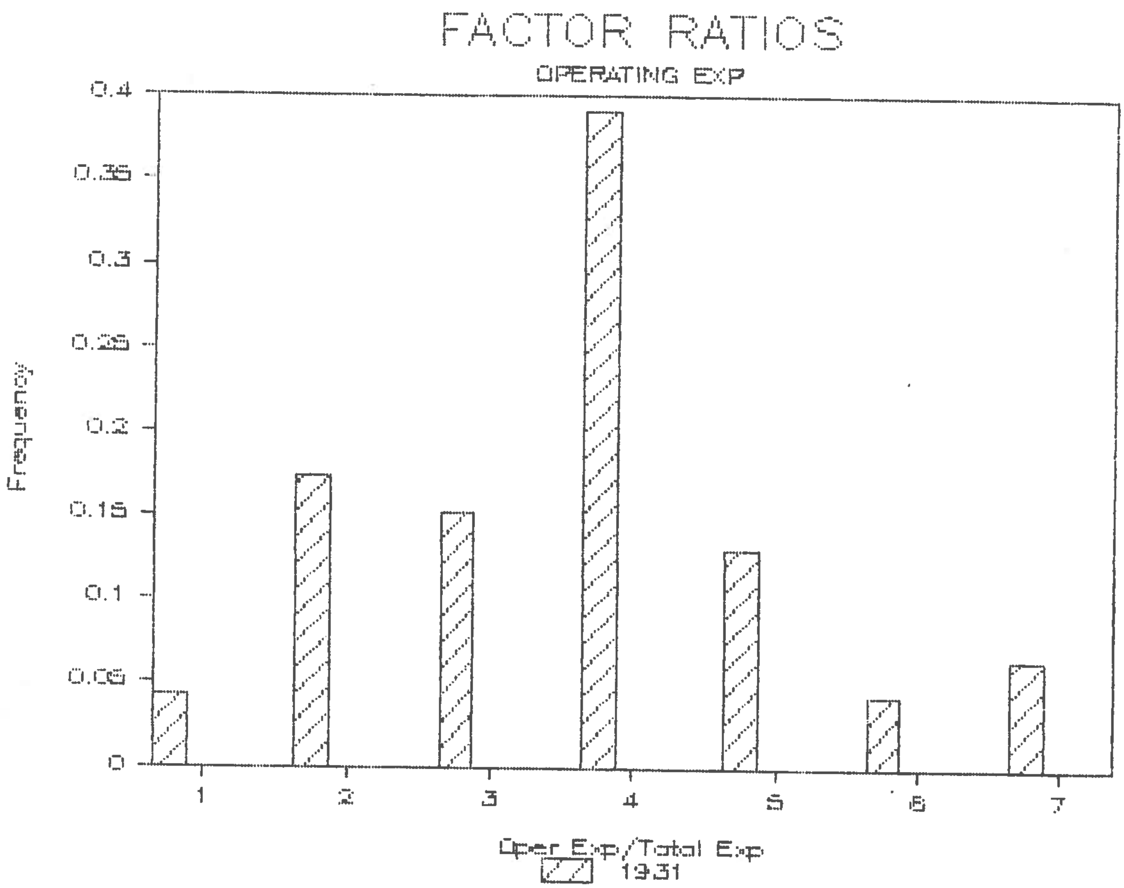


FIGURE 4


FACTOR RATIOS
Shift in Labor Ratio
0.9
0.8
0.7
0.6
0.5
0.4
0.3
1981
0.3
0.5
0.7
0.9
1970



1 : < .10
2 : .10 - .15
3 : .15 - .20
4 : .20 - .25
5 : .25 - .30
6 : .30 - .40
7 : > .40

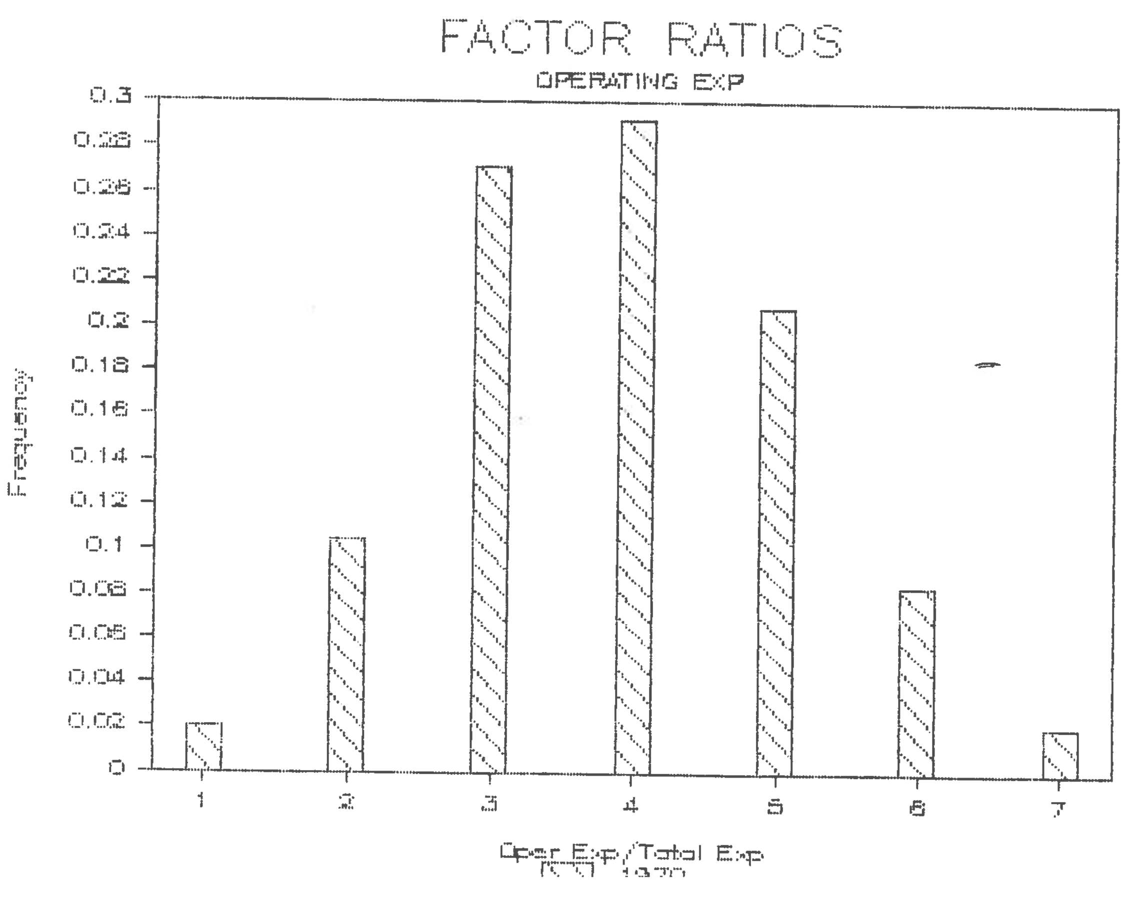


FIGURE 6

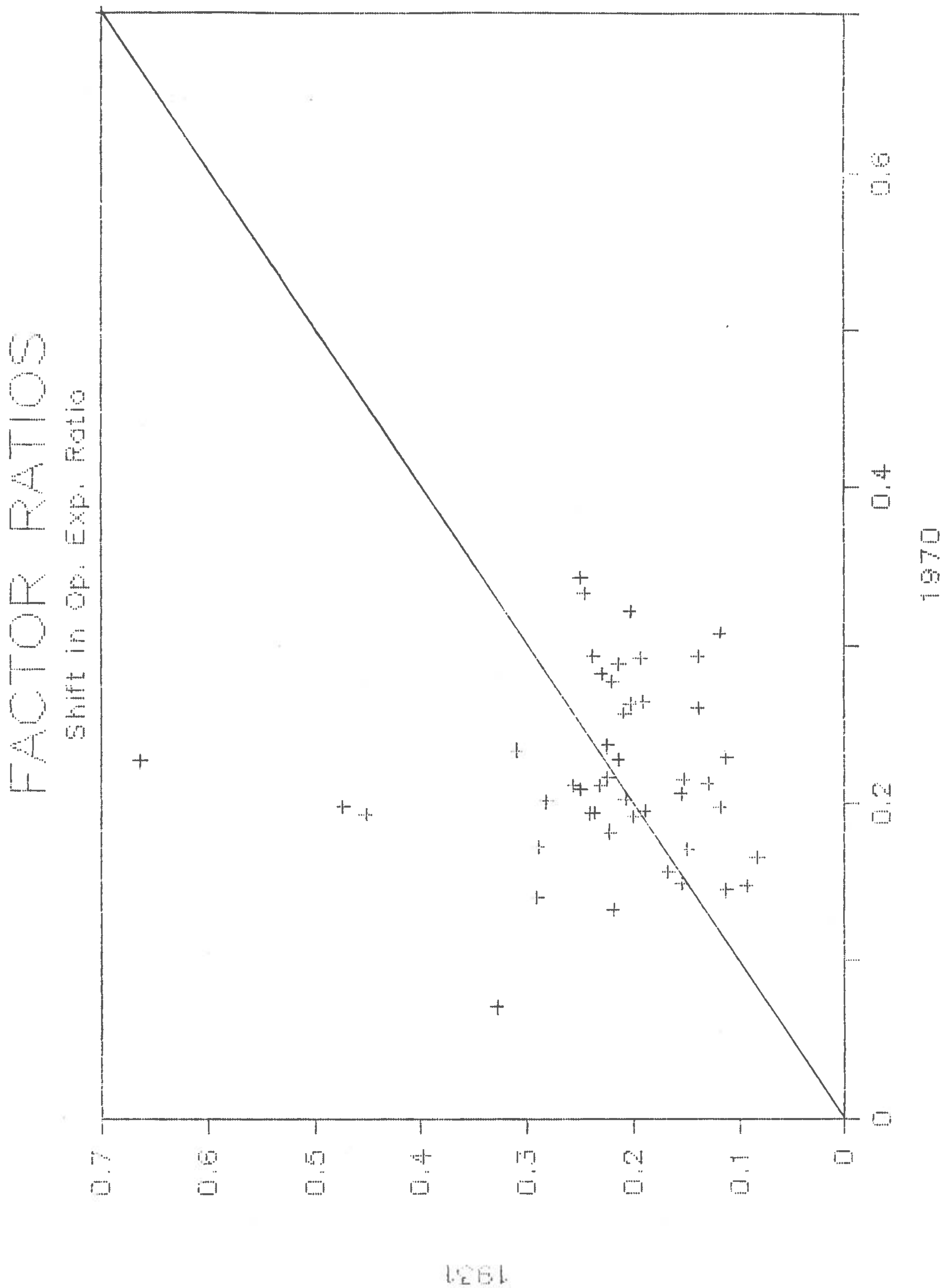
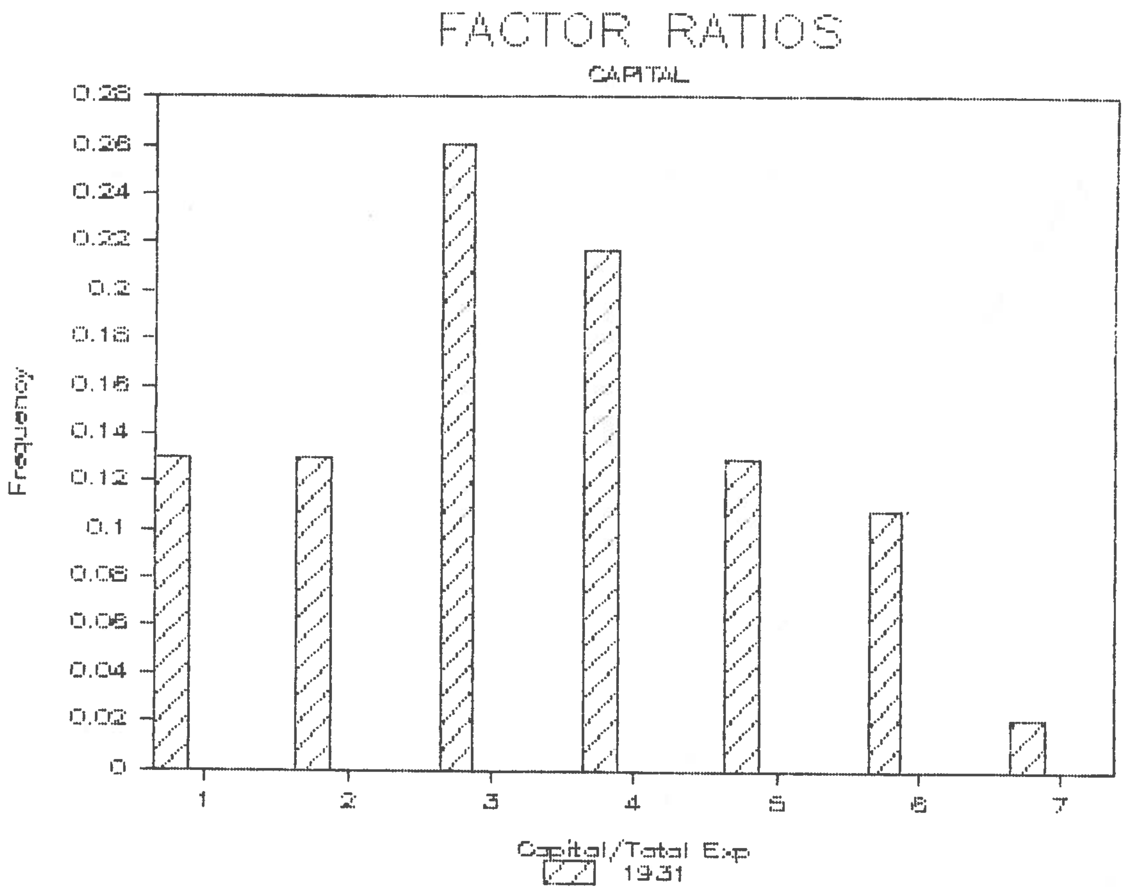
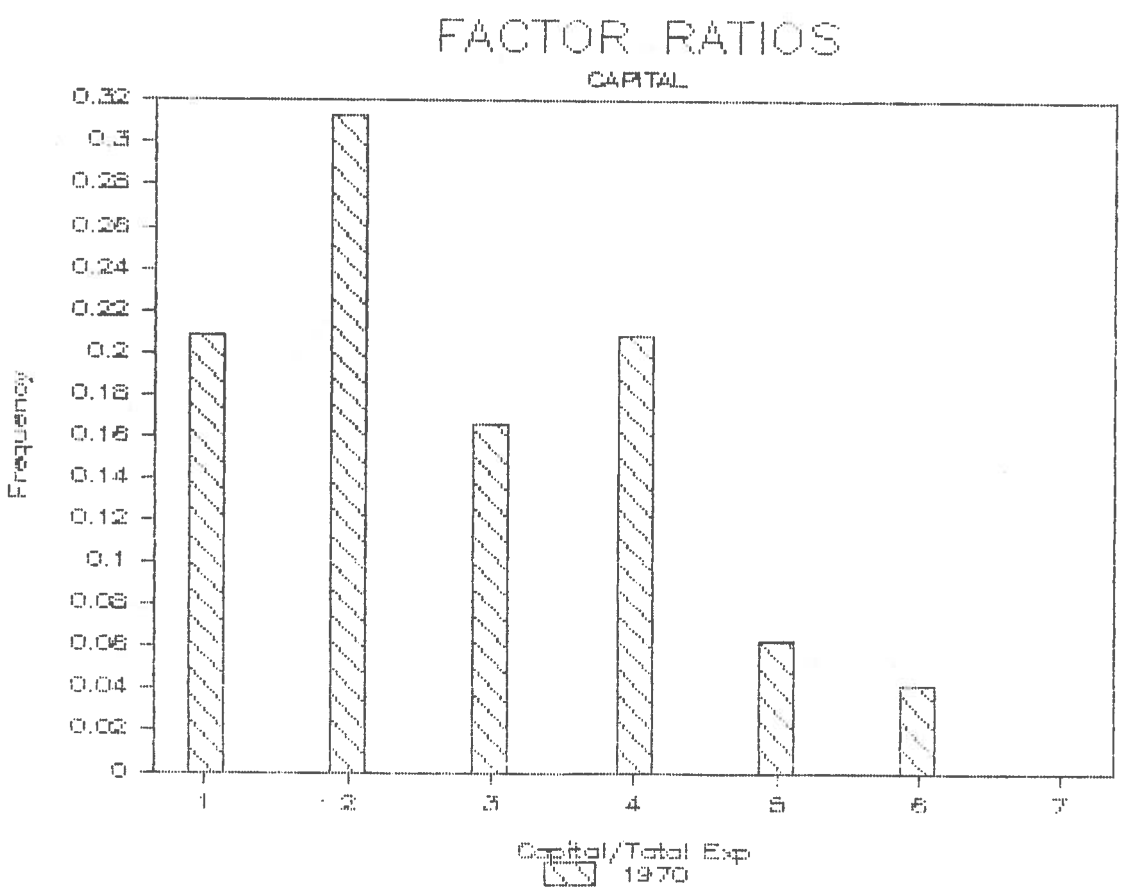

FACTOR RATIOS
Shift in Op. Exp. Ratio
1970
1931
0
0.2
0.4
0.6
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

FIGURE 7





1: .025 - .05

2: .05 - .075

3: .075 - .10

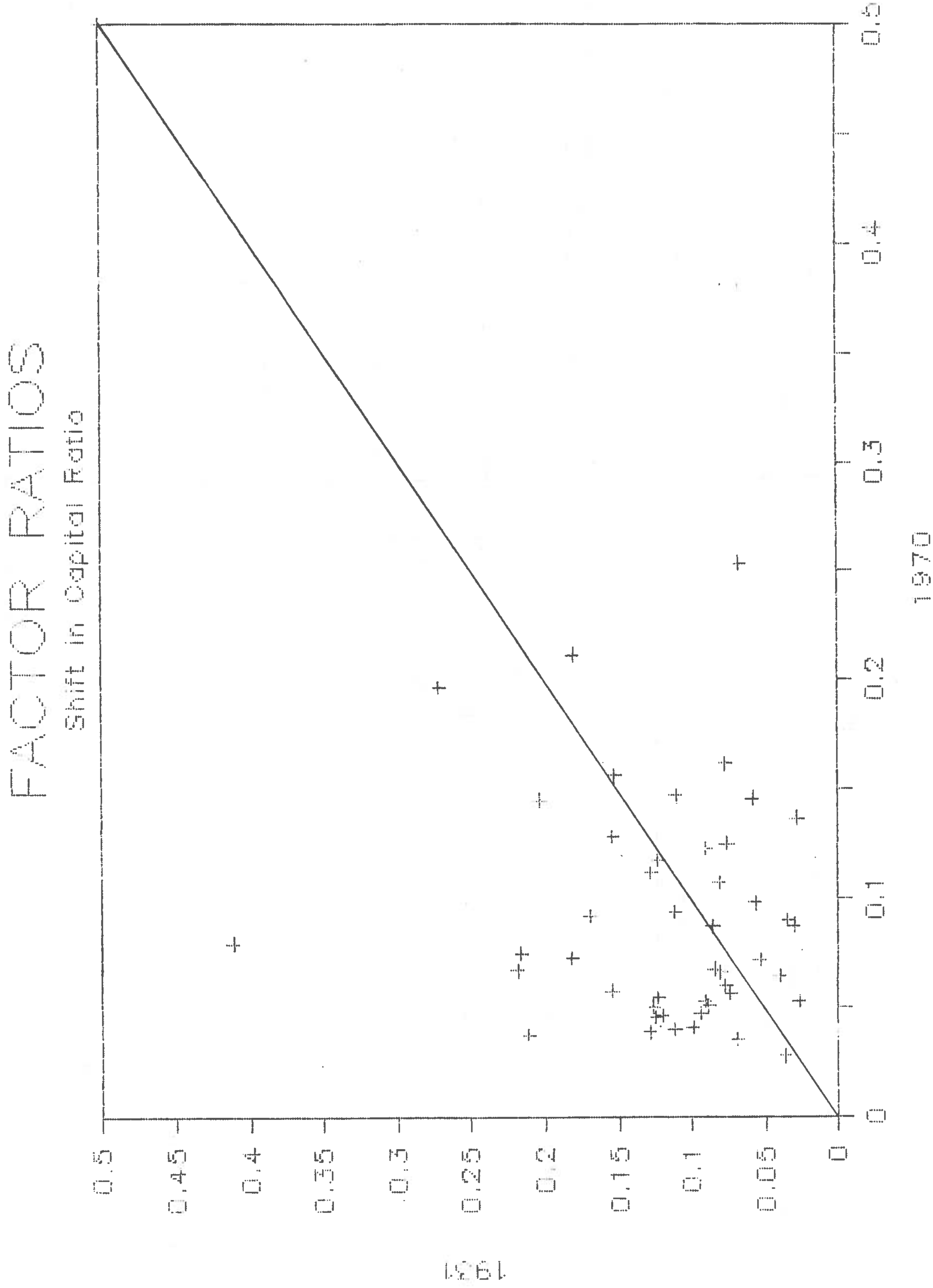
4: .10 - .15

5: .15 - .20

6: .20 - .30

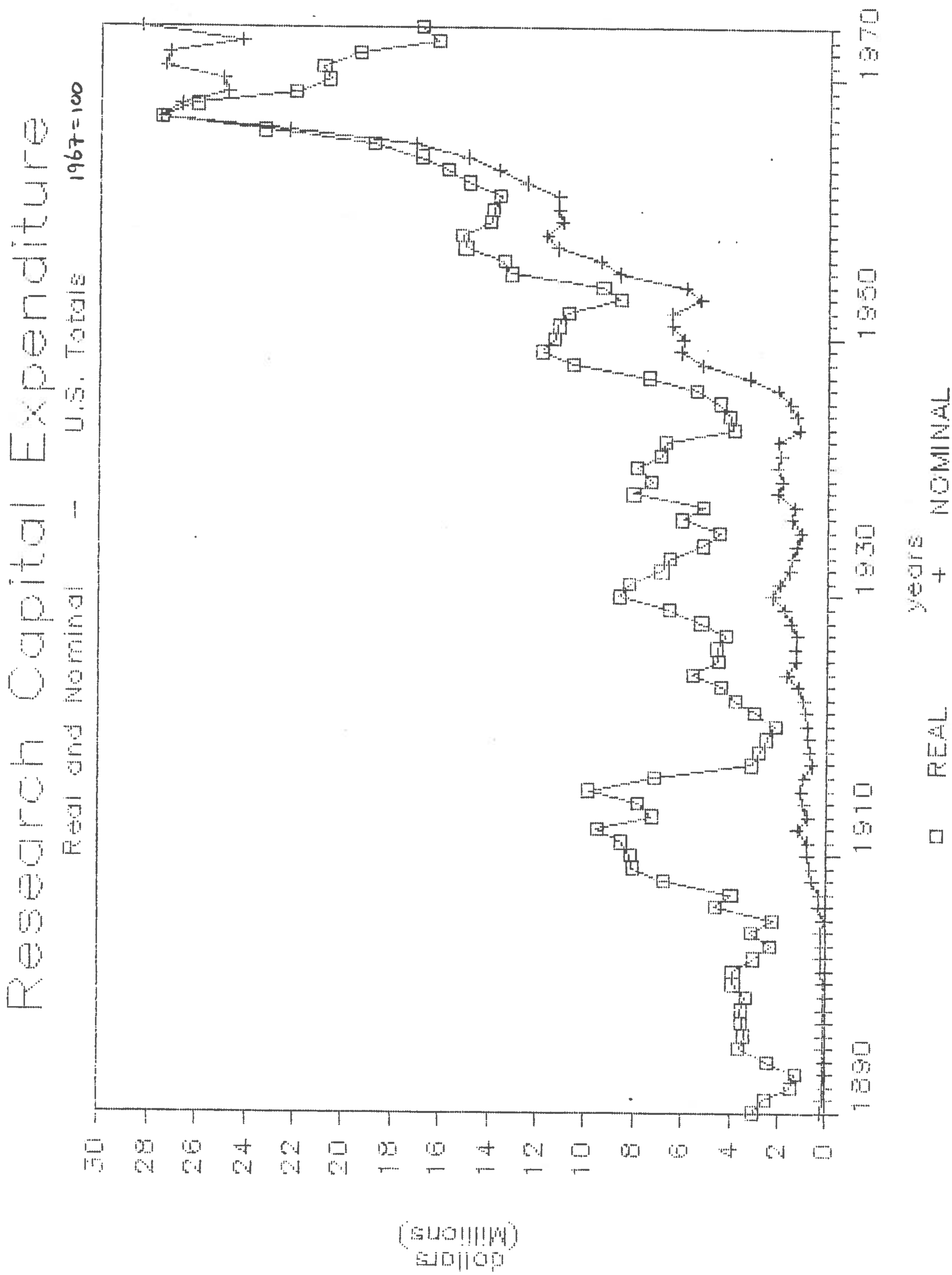
7: >.30

FIGURE 8



FACTOR RATIOS
Shift in Capital Ratio
1970
1931
0
0.1
0.2
0.3
0.4
0.5
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5

FIGURE 9



Research Capital Expenditure
Real and Nominal - U.S. Totals
1967=100
dollars (Millions)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
1890
1910
1930
1950
1970
years
□ REAL
+ NOMINAL

FIGURE 10

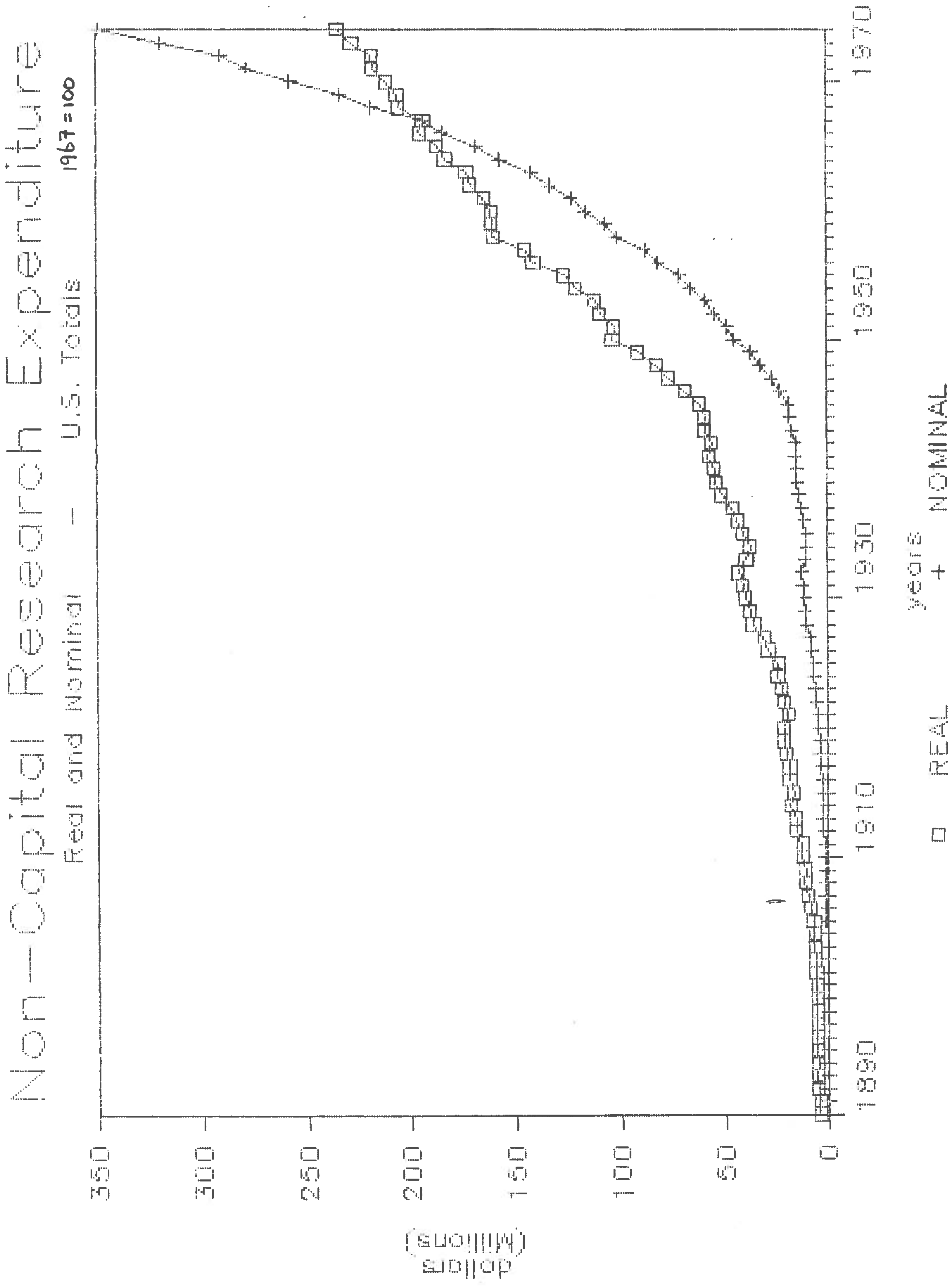
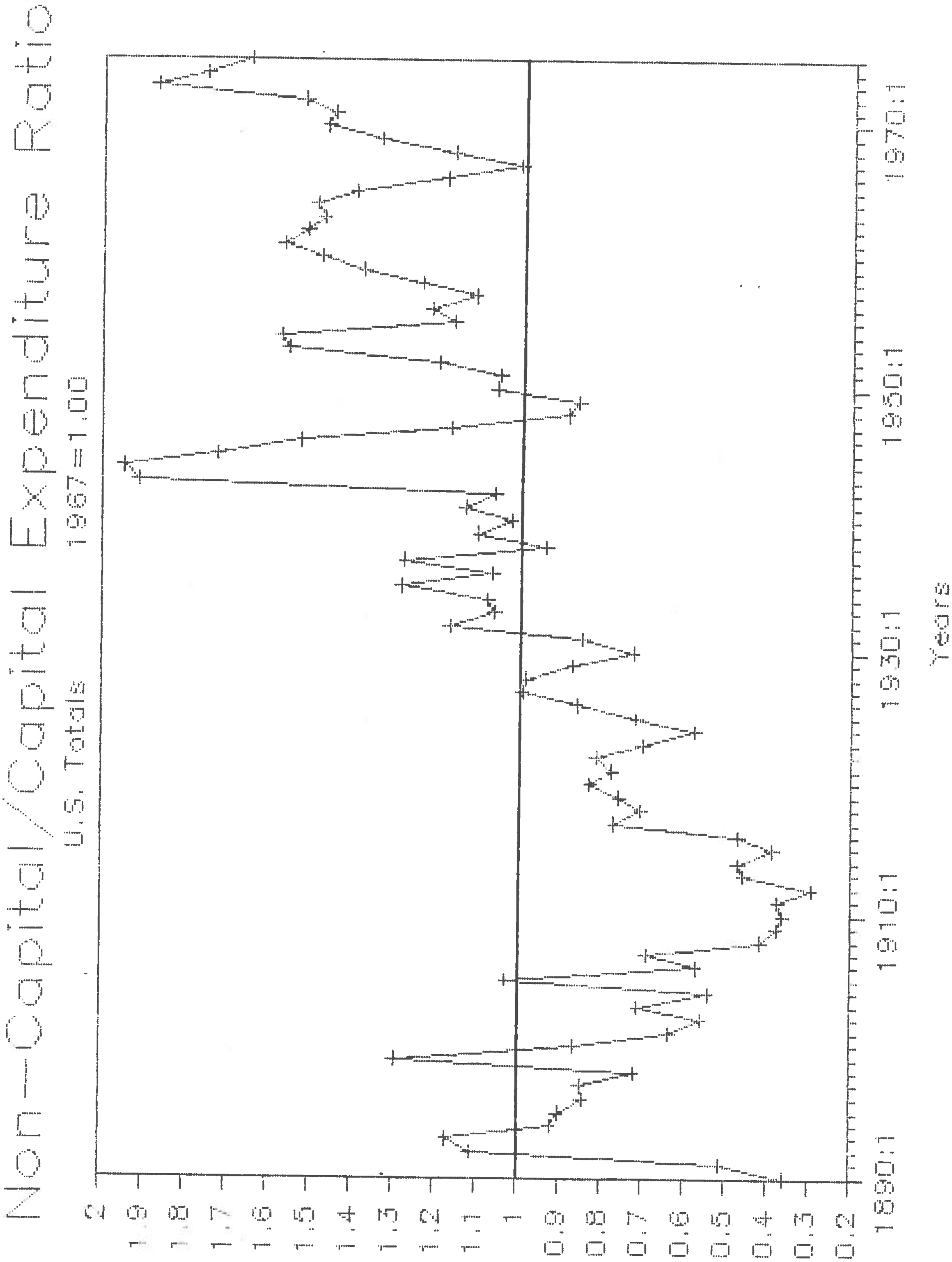
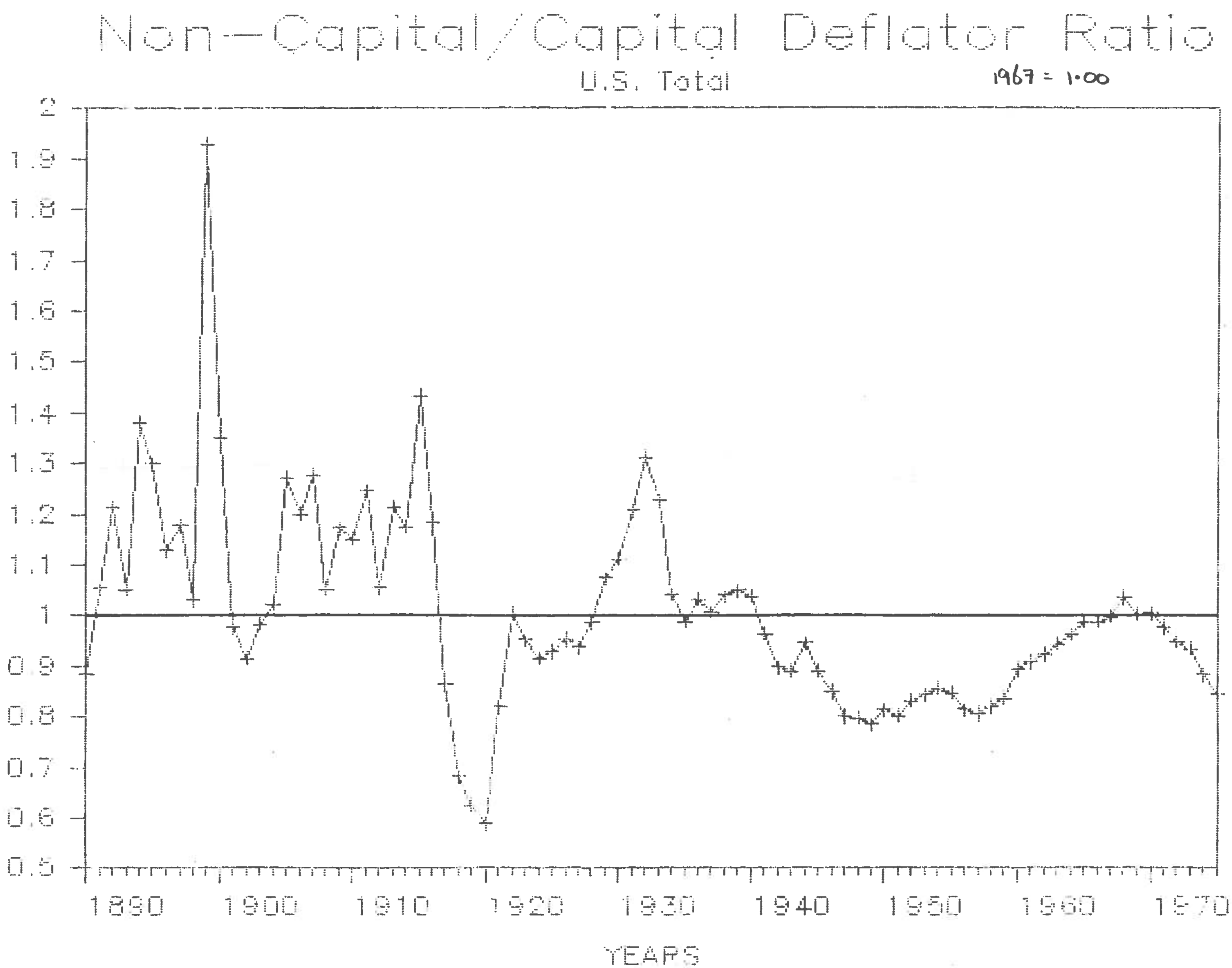

Non-Capital Research Expenditure
Real and Nominal — U.S. Totals
1967=100
dollars (Millions)
0
50
100
150
200
250
300
350
1890
1910
1930
1950
1970
years
□ REAL
+ NOMINAL

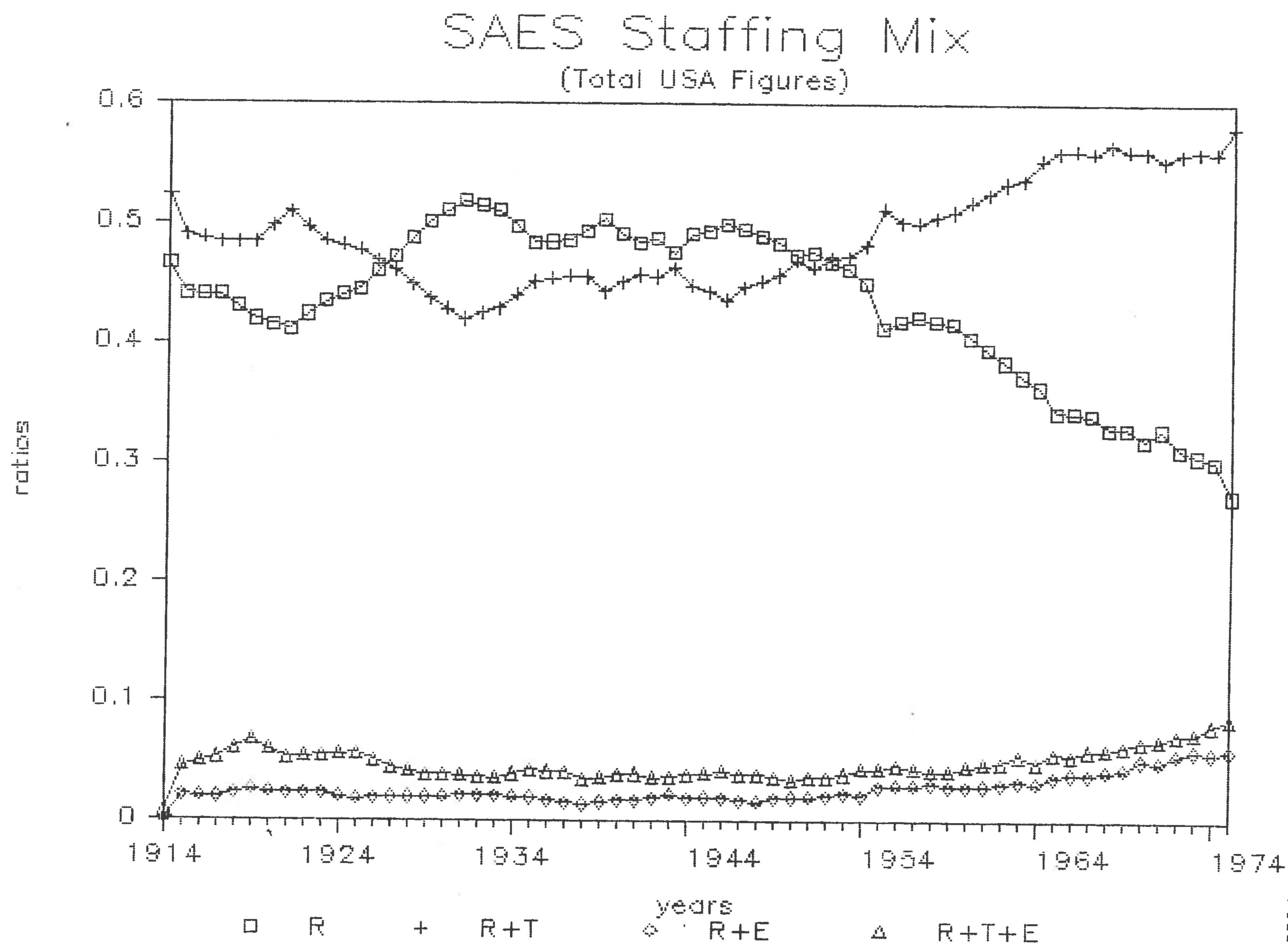
FIGURE 11



Non-Capital/Capital Expenditure Ratio
U.S. Totals
1967=1.00
Years
1890:1
1910:1
1930:1
1950:1
1970:1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2

FIGURE 12

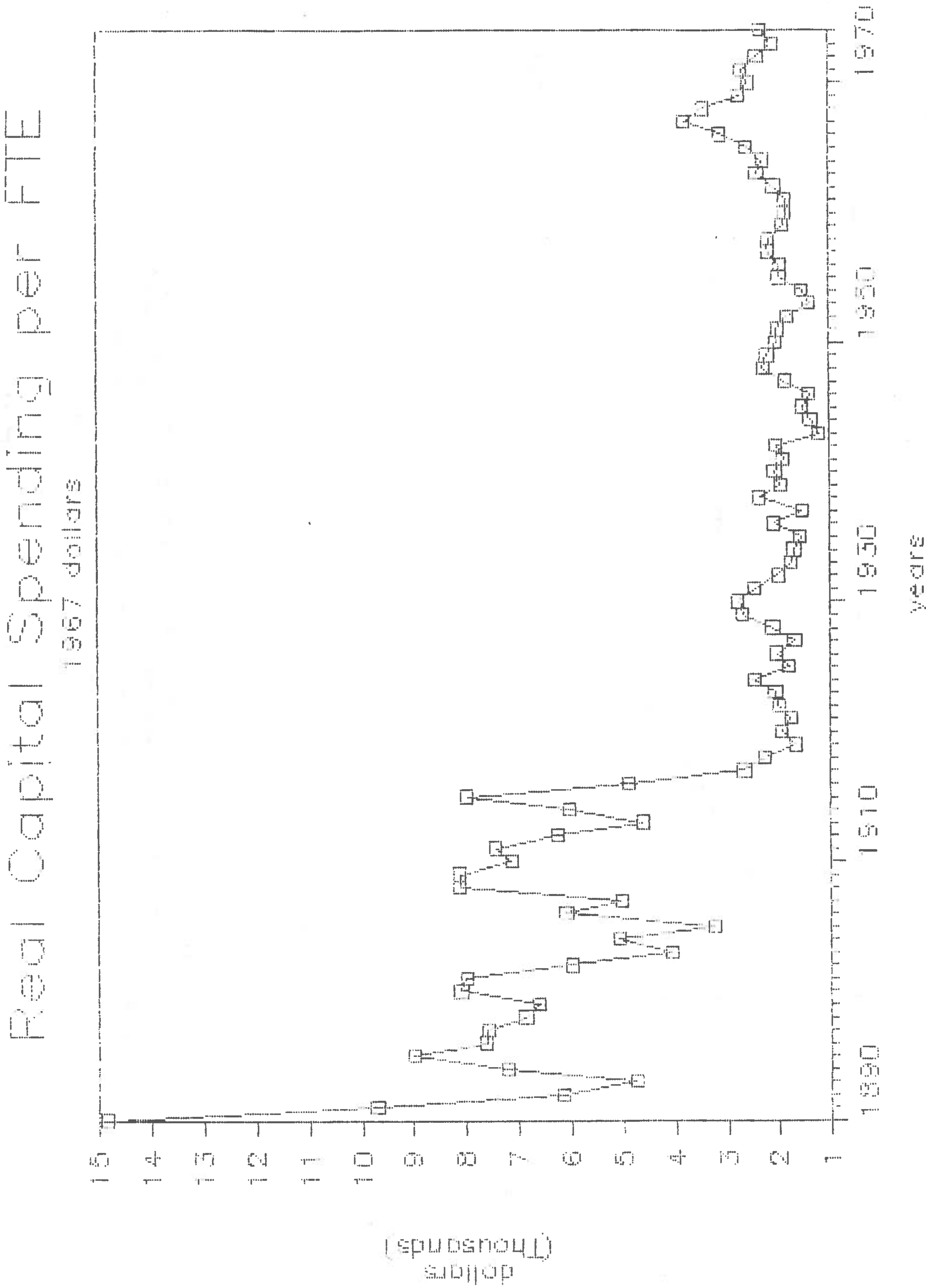

Non-Capital/Capital Deflator Ratio
U.S. Total
1967 = 1.00
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
1890
1900
1910
1920
1930
1940
1950
1960
1970
YEARS



SAES Staffing Mix
(Total USA Figures)
ratios
0.6
0.5
0.4
0.3
0.2
0.1
0
1914
1924
1934
1944
1954
1964
1974
years
R
R+T
R+E
R+T+E

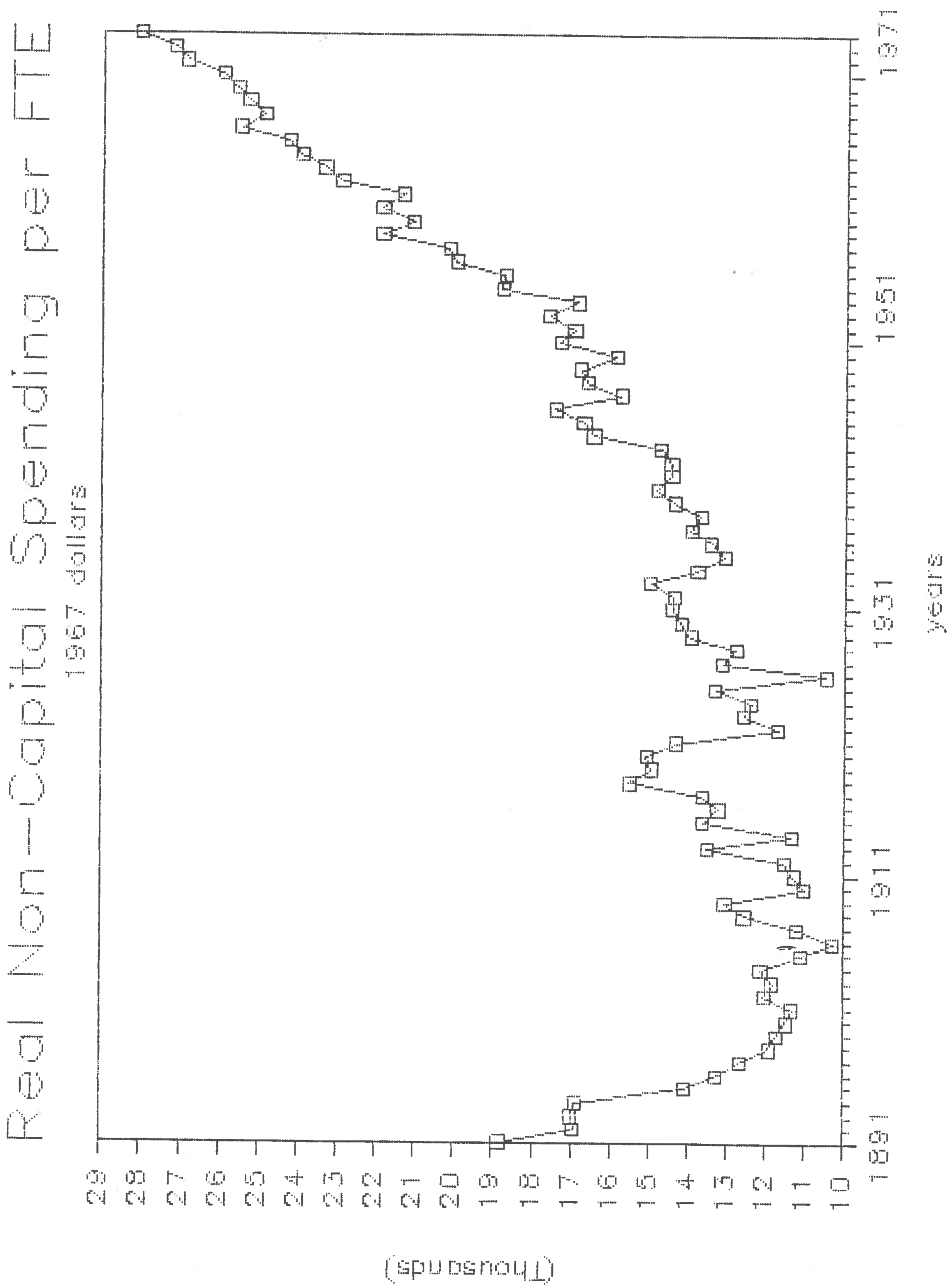
FIGURE 13

FIGURE 14



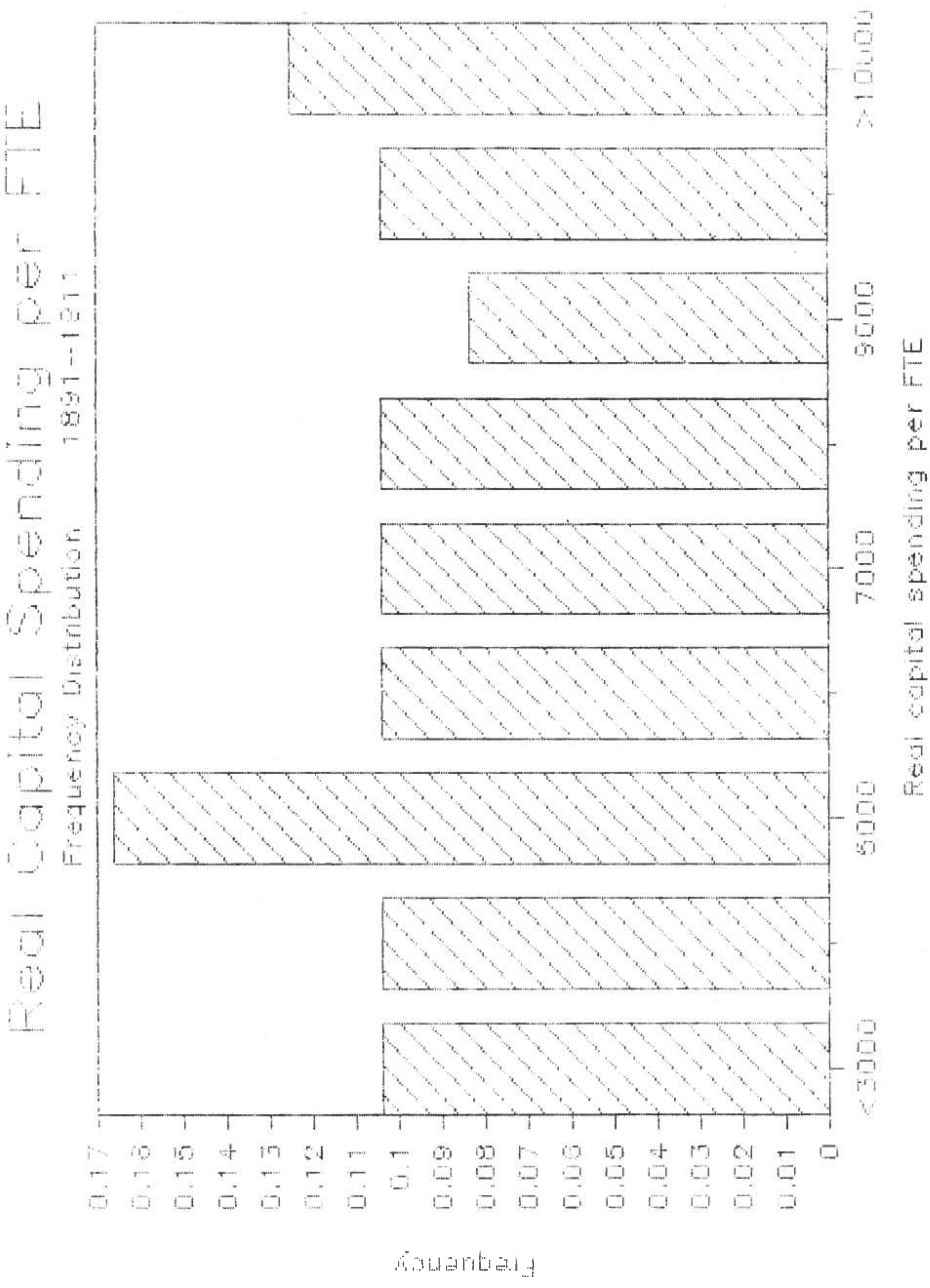
Real Capital Spending per FTE
1967 dollars
years
dollars (Thousands)
1890
1910
1930
1950
1970
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

FIGURE 15



Real Non-Capital Spending per FTE
1967 dollars
(Thousands)
years
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
1891
1911
1931
1951
1971

FIGURE 16


Real Capital Spending per FTE
Frequency Distribution 1891-1911
Real capital spending per FTE
<3000
5000
7000
9000
>10000
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
0.11
0.12
0.13
0.14
0.15
0.16
0.17

Real Capital Spending per FTE

Frequency Distribution 1954-1974

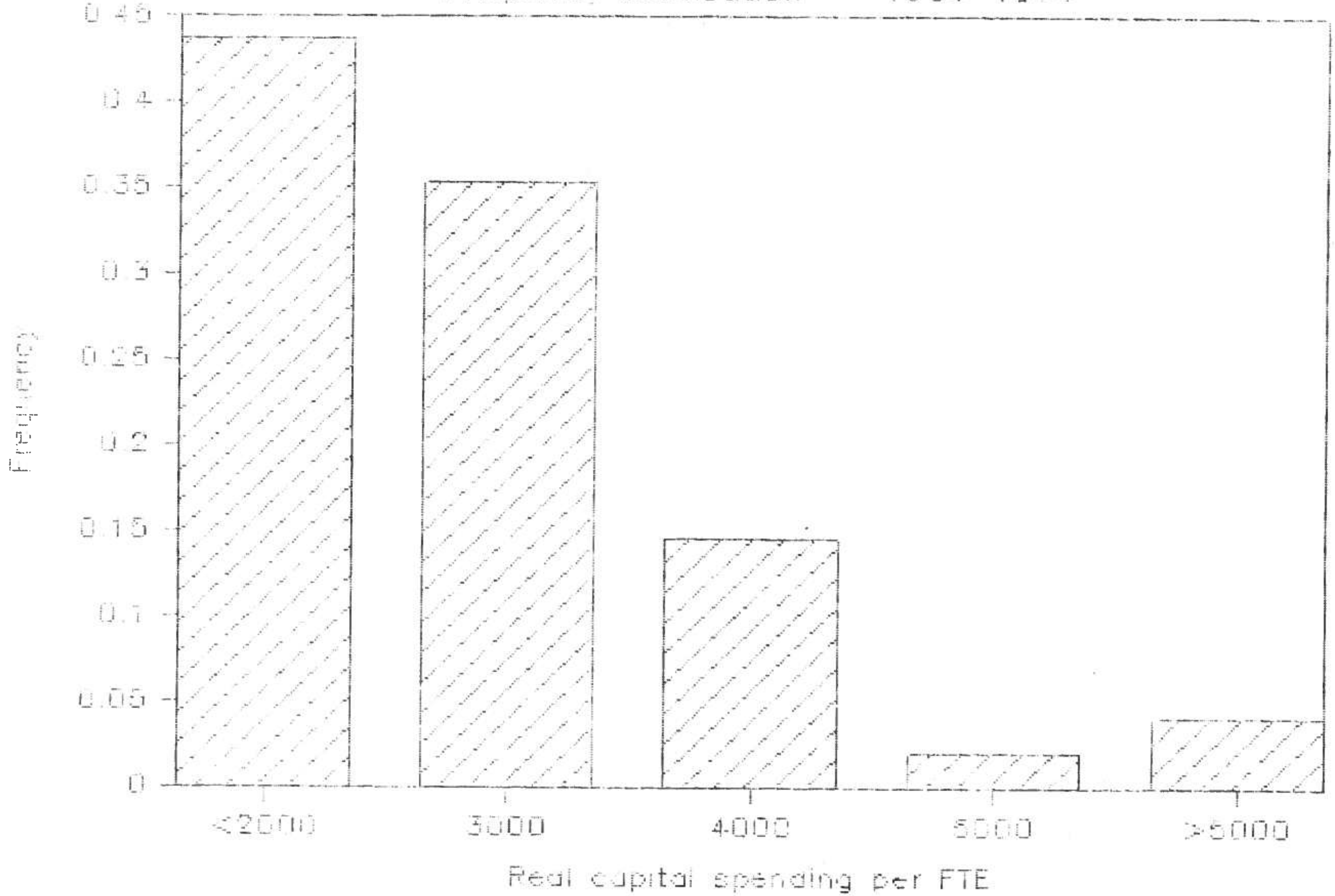
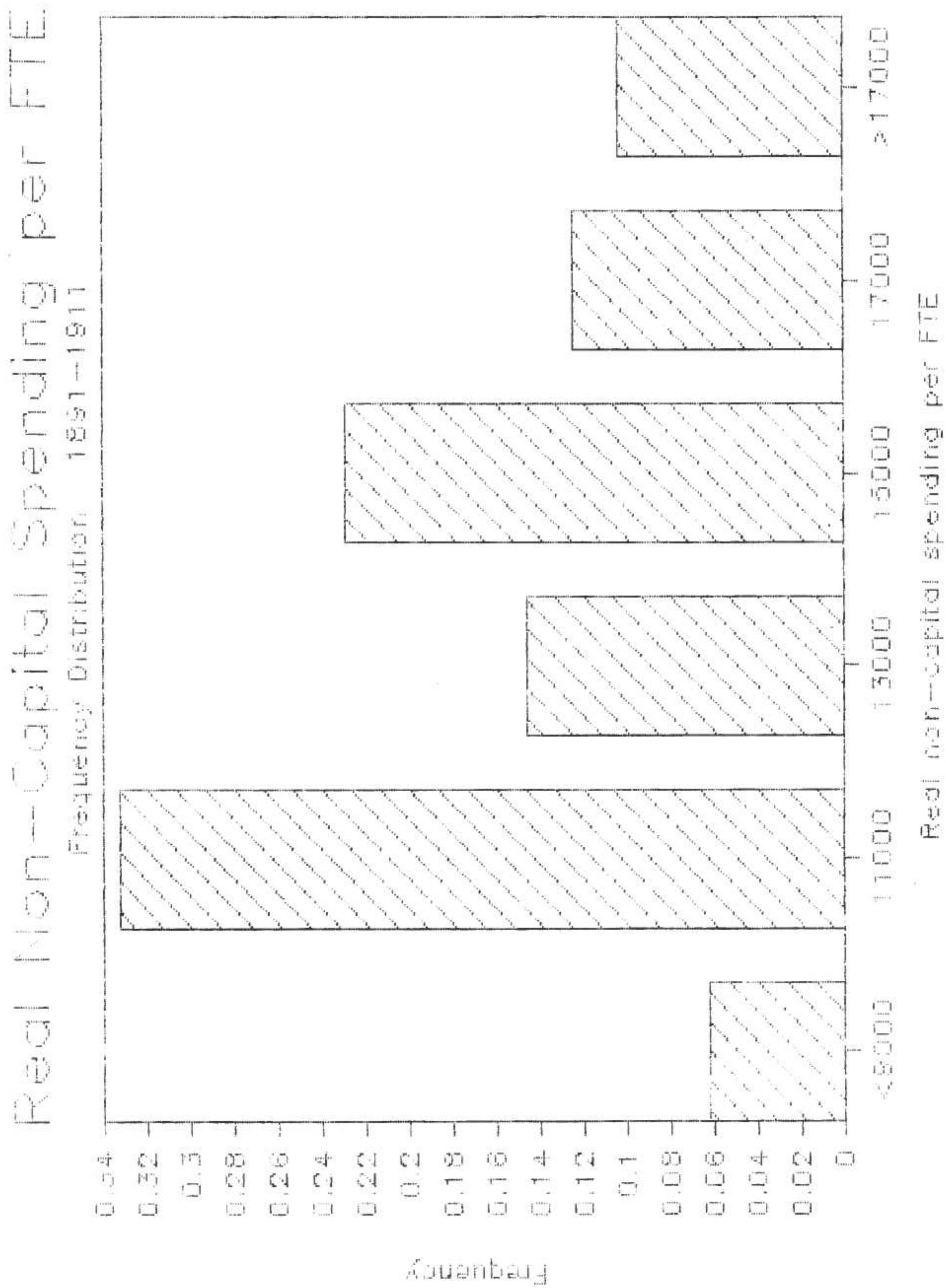


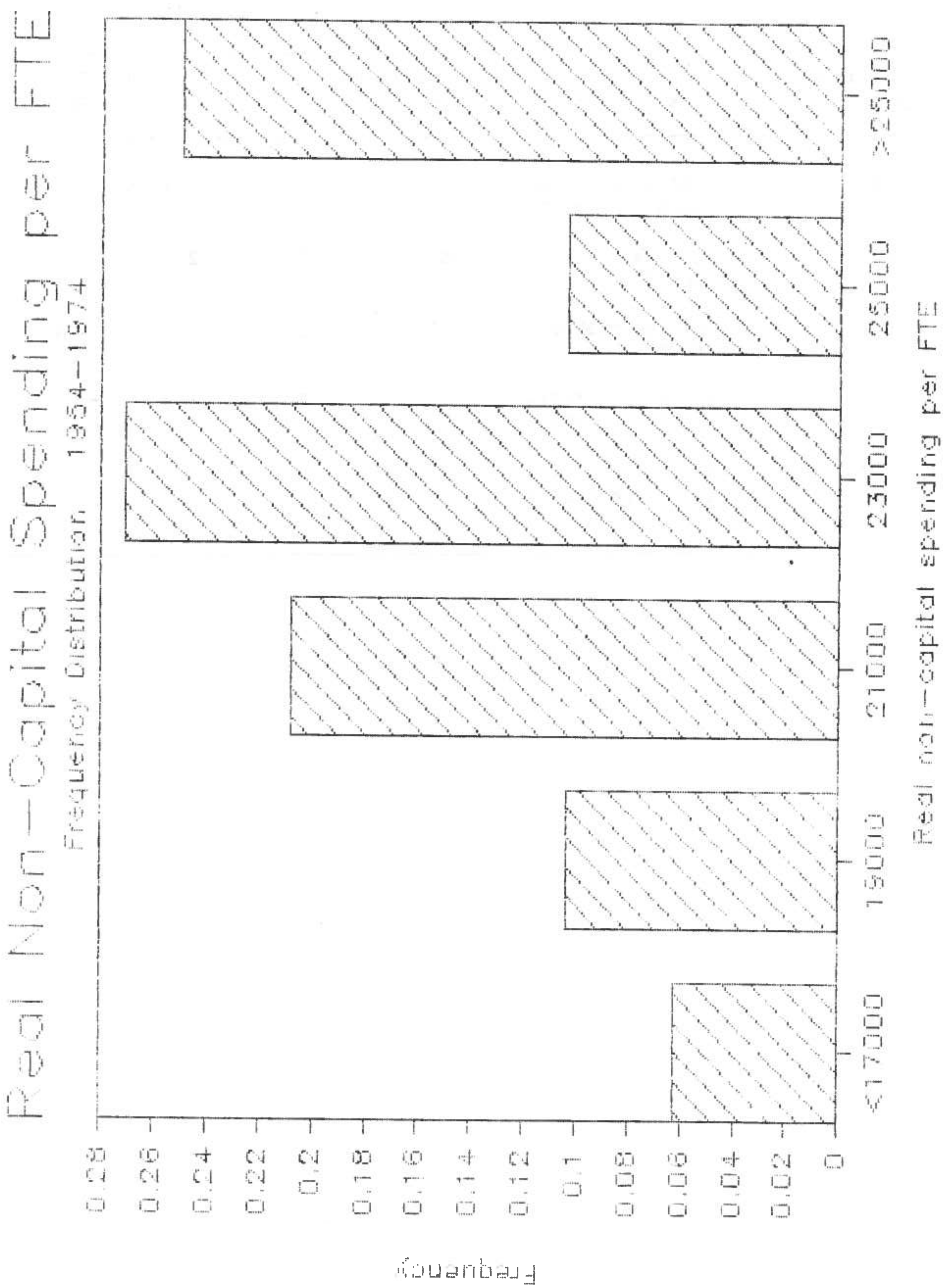
FIGURE 17

FIGURE 18



Real Non-Capital Spending per FTE
Frequency Distribution 1891-1911
Frequency
0.34
0.32
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
<9000
11000
13000
15000
17000
>17000
Real non-capital spending per FTE

FIGURE 19



Real Non-Capital Spending per FTE
Frequency Distribution 1954-1974
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Frequency
<17000
19000
21000
23000
25000
>25000
Real non-capital spending per FTE

Summary Table of SAES Variables

Variable Name	Variable Description	1891-1911 Mean	1891-1911 St. Dev.	1954-1974 Mean	1954-1974 St. Dev.
NCAP	Real non-capital spending per FTE	12961.2	3310.8	23094.8	4773.9
CAP	Real capital spending per FTE	6818.7	3600.7	2377.7	978.4
SIZE	Average number of FTE	12.8	5.5	145.7	88.3
FTR	Percent of full-time researchers	46.4	25.1	33.8	14.8
GROW	Average yearly growth rate of FTE	13.2	10.9	1.3	1.7

Regression Results: Dependent Variable is Capital Spending per FTE

EQUATION 1
DEPENDENT VARIABLE 3 CAP
FROM 1900- 1 UNTIL 1995- 1
OBSERVATIONS 96 DEGREES OF FREEDOM 92
R**2 .53374756 RBAR**2 .51854367
SSR .52578925E+09 SEE 2390.6277
DURBIN-WATSON 1.93626479

NO.	LABEL	VAR	LAG	COEFFICIENT	STAND. ERROR	T-STATISTIC
***	*******	***	***	************	************	************
1	CONSTANT	0	0	4506.701	634.0962	7.107283
2	SIZE	4	0	-8.859797	2.966265	-2.986853
3	FTR	5	0	-1874.511	1154.395	-1.623804
4	GROW	6	0	212.6667	27.59533	7.706619

DEPENDENT VARIABLE 3 CAP
FROM 1900- 1 UNTIL 1995- 1
OBSERVATIONS 96 DEGREES OF FREEDOM 91
R**2 .59607094 RBAR**2 .57831582
SSR .45550765E+09 SEE 2237.3150
DURBIN-WATSON 1.90299752

NO.	LABEL	VAR	LAG	COEFFICIENT	STAND. ERROR	T-STATISTIC
***	*******	***	***	************	************	************
1	CONSTANT	0	0	3172.527	692.0525	4.584228
2	SIZE	4	0	.6026130	3.752782	.1605777
3	FTR	5	0	-3230.288	1139.342	-2.835223
4	GROW	6	0	159.5038	29.46619	5.413111
5	TIME	19	0	3029.511	808.4977	3.747086

DEPENDENT VARIABLE 3 CAP
FROM 1900- 1 UNTIL 1995- 1
OBSERVATIONS 96 DEGREES OF FREEDOM 88
R**2 .60998105 RBAR**2 .57895681
SSR .43982134E+09 SEE 2235.6140
DURBIN-WATSON 1.97287589

NO.	LABEL	VAR	LAG	COEFFICIENT	STAND. ERROR	T-STATISTIC
***	*******	***	***	************	************	************
1	CONSTANT	0	0	3626.939	797.7076	4.546702
2	SIZE	4	0	-.6128393	3.858870	-.1588132
3	FTR	5	0	-3668.319	1240.890	-2.956201
4	GROW	6	0	157.4640	31.24606	5.039483
5	DD1A	16	0	-265.8569	666.1787	-.3990775
6	DD2A	17	0	-711.5416	686.6651	-1.036228
7	DD3A	18	0	435.2000	704.1888	.6180160
8	TIME	19	0	2947.602	809.3503	3.641935

Regression Results: Dependent Variable is Non-Capital Spending per FTE

EQUATION 1
DEPENDENT VARIABLE 2 NCAP
FROM 1900- 1 UNTIL 1995- 1
OBSERVATIONS 96 DEGREES OF FREEDOM 92
R**2 .63140964 RBAR**2 .61939039
SSR .14931082E+10 SEE 4028.5776
DURBIN-WATSON 1.92048242

NO.	LABEL	VAR	LAG	COEFFICIENT	STAND. ERROR	T-STATISTIC
***	*******	***	***	***********	***********	***********
1	CONSTANT	0	0	18537.13	1068.550	17.34793
2	SIZE	4	0	46.04909	4.998616	9.212370
3	FTR	5	0	-8865.758	1945.335	-4.557446
4	GROW	6	0	-82.67827	46.50240	-1.777936

DEPENDENT VARIABLE 2 NCAP
FROM 1900- 1 UNTIL 1995- 1
OBSERVATIONS 96 DEGREES OF FREEDOM 91
R**2 .69877939 RBAR**2 .68553892
SSR .12202028E+10 SEE 3661.8058
DURBIN-WATSON 2.13514502

NO.	LABEL	VAR	LAG	COEFFICIENT	STAND. ERROR	T-STATISTIC
***	*******	***	***	***********	***********	***********
1	CONSTANT	0	0	21166.18	1132.680	18.68681
2	SIZE	4	0	27.40304	6.142166	4.461461
3	FTR	5	0	-6194.146	1864.757	-3.321691
4	GROW	6	0	22.08139	48.22721	.4578617
5	TIME	19	0	-5969.773	1323.265	-4.511394

DEPENDENT VARIABLE 2 NCAP
FROM 1900- 1 UNTIL 1995- 1
OBSERVATIONS 96 DEGREES OF FREEDOM 88
R**2 .70614155 RBAR**2 .68276645
SSR .11903797E+10 SEE 3677.9127
DURBIN-WATSON 2.11358904

NO.	LABEL	VAR	LAG	COEFFICIENT	STAND. ERROR	T-STATISTIC
***	*******	***	***	***********	***********	***********
1	CONSTANT	0	0	20641.19	1312.346	15.72847
2	SIZE	4	0	29.46475	6.348406	4.641283
3	FTR	5	0	-5776.959	2041.446	-2.829837
4	GROW	6	0	31.68300	51.40435	.6163485
5	DD1A	16	0	-79.53133	1095.962	-.7256763E-01
6	DD2A	17	0	1004.155	1129.665	.8888967
7	DD3A	18	0	-591.9728	1158.494	-.5109848
8	TIME	19	0	-5862.792	1331.500	-4.403149