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THE RATE OF RETURN

IN GERMAN MANUFACTURING INDUSTRY

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The Rate of Return in German Manufacturing Industry

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A. The Problem

Economic development in the industrialized countries is in
a vicious circle. In order to master the problems of economic
change, of unemployment, and of declining productivity, the
economies need risk capital. However, the returns on risk
capital seem to decline steadily. Thus it becomes less and
less attractive for private and institutional investors to
hold equity. The firms resort to credit financing of invest-
ments in fixed assets, and the banking institutions develop
new forms of industrial credit and of leasing of equipment
to meet the rising demand for long-term credit financing of
manufacturing industry. This,of course,increases financial
risk of equity holders. The risk-premium on equity capital
rises. The declining returns on equity prove less and less
adequate to cover the risk premia. Share prices decline
consequently.

Economic policy has in the past tried to break this vicious
circle by shifting part of the business risk to the govern-
ment. Investment incentives, fast tax right-offs, loss carry
backs as well as government subsidies for R & D-outlay are
all intended to share the business risk incurred by the firms'
investment in plant and equipment. The governments' share
in business risk is, of course, the higher, the higher the
tax-rate is. High tax-rates on the other hand reduce the
returns from successful business ventures. If government
participation in the losses is not adequate to offset the
losses in returns from government participation in the profits,

then clearly the firms will tend to reduce business risk.
There are two ways for companies to reduce business risk:
by diversification and by shifting investment to less risky
assets. Diversification is achieved by growing inside and in
market-share, changing the structure of the business portfolio
leads to a decreasing ratio of fixed assets to capital in-
vested and to a higher proportion of liquid assets.

In this paper we will show that

1. the rate of return on total capital
   has declined. This is explained by increased
   competition and decreasing business risk,

2. the rate of return on equity has declined.
   The reduction in business risk could account
   for this development if financial risk had
   remained constant. However,

3. financial risk has increased. Rising interest
   rates on debt-capital and increasing debt-equity-
   ratios are evidence of this fact.

The resulting paradox of equity finance may be explained by
hidden returns on equity. There are various forms of such
returns. Agency cost is one, government subsidies for the
acquisition of equity by   private investors is another
and convertible bonds which tie high interest rates on the
bonds to ownership of equity is still another.

B. The Methodology

The following empirical analyses of the hypotheses advanced
will be based on data of German manufacturing firms from
various sources. The sources will be explained in the first
paragraph of this section. In the second paragraph we will

shortly comment on the statistical methods used to analyze
the data.

I. The Data Banks

There are many sources of information on the profitability
of German manufacturing corporations. However, there are no
national accounts available for Germany that cover the entire
manufacturing sector and provide data on the profitability
of manufacturing industry in the detailed form that was felt
necessary in order to make international comparisons possible.

All the data available are derived from company financial reports.
There are basically five major sources of information:

- the Federal Statistical Office (Statistisches
  Bundesamt)

- the Central Bank (Deutsche Bundesbank)

- the Association of Savings Banks
  (Sparkassen- und Giroverband)

- the Industrial Credit Bank (Industriekredit-
  bank AG Deutsche Industriebank)

- the Bonn Sample (Bonner Stichprobe).

The Association of Savings-Banks and the Industrial Credit
Bank do not collect the material in a form that lends itself
easily to statistical analyses. The firms covered vary
from year to year and the composition of the sample depends
on whether there are client relationships with these instit-
utions or not. The Central Bank uses the financial reports
of all the firms that have to file reports with it because
directly or indirectly they do business with the Central Bank.
These firms vary annually. The financial reports are either
tax-returns or financial reports published by corporations.
The valuation and reporting standards of these two sources
of information differ widely. For reasons of confidentiality
the Central Bank publishes aggregate data only[1].

Thus there remain just two sources of data for the analysis
of trend in the profitability of German manufacturing firms.
The data banks of the Federal Statistical Office and of the
Business Economics Institute of Bonn University contain the
data of the annual financial reports of German corporations.
There are 373 (1977) German corporations in manufacturing
industry. They represent about 30% of total employment and about
45% of total sales in manufacturing. Small and medium sized
companies do not have to publish financial reports. Their
tax returns are not available for analysis. We have to assume
that the financial reports of German manufacturing corporations
reflect adequately trends in the development of all the manu-
facturing firms. However, caution is required in the interpret-
ation of the level of profits.

The data of the Federal Statistical Office are published annually
in the Statistical Yearbook[2]. We have also used the cost of
living-index and data from the national accounts published
by the Federal Statistical Office.

The capital market statistics used in the analysis were taken
from sources published by the Central Bank. In particular
we used the index of share prices as computed by the Central
Bank[3].

The Bonn Sample is a collection of financial reports at the
Business Economics Institute of Bonn University. At present
222 industrial corporations are covered by the Bonn Sample.
Individual data are available for the years from 1961 through
1979. Information not available from the financial reports
is taken from newspapers and other sources. In particular,
stock prices of the companies in the Bonn Sample are taken
from stock exchange publications.

II. The Data

The Data of the Federal Statistical Office as well as those
of the Bonn Sample are from financial reports which are pub-
lished annually according to German corporation law. Two
major revisions of publication requirements were put into effect
in the Corporation Act of 1959 and the Corporation Act of 1965.
Until 1959 corporations were not required to publish sales.
They reported sales net of purchases of raw·materials. This
is the reason why we limit the present analysis to years
beginning in 1961, the first year for which the new public-
ation requirements became effective.

The Corporation Act of 1965 brought significant changes in the
standards of valuation. Strict rules for evaluation of de-
preciation allowances and of inventories were passed. They
stressed the principle of consistency as well as the principle
of cautiously reporting equity in profits. Thus: BASF corp-
oration states in its 1979 annual report that equity would
be higher by 40% if SEC-rules had been applied instead of
German valuation standards. Historical cost reporting prevails
throughout. The valuation of inventories is based on moving
averages. Lifo and Fifo are not illegal under the Corporation
Act, it is true, but cannot be used for taxation purposes. Therefore,
on the whole corporations use the same valuation method for
inventories in published financial reports as in their tax
returns.

The definitions of capital and profits are based on the format
of the balance sheet as prescribed by German law. The appendix
gives details. They follow as closely as accounting laws that
differ from country to country permit the conventions that
were agreed upon by the group. The definition of risk will
be given in the relevant section of this paper.

The Federal Statistical Office publishes aggregate data.
The individual entries in the financial reports are summed
to give the total entry. Ratios are derived from aggregate
data. They are therefore weighted averages. The Bonn Sample
contains data of the individual firms. We prefer to compute
ratios for the sample as a whole as averages of firm ratios.
We thus have unweighted averages. However, weighted averages
are given also to make comparison with the data of the Federal
Statistical Office possible.

Real data were computed from the nominal data. Inflation
accounting has a long history in German accounting theory
dating back to the early twenties. The method used here
applies replacement cost indices to individual items in the
balance sheet and takes estimates of useful livetimes of
equipment into account in arriving at current cost valuation.
Details of the method used are given in a paper submitted to
the group by Koll[4]. The same method is used for nominal data
of the Federal Statistical Office as well as for the data
in the Bonn Sample.

III. The Methods of Analysis

We are interested in the development of the rate of return
of German manufacturing industry. The development is best
described by the time series of annual data. We consider
these time series to be the raw material from which further
hypotheses about trends can be derived. The time series based
on the data of the Federal Statistical Office cover all
corporations (without financial institutions such as banks
and insurance companies). They cover the period from 1961 to
1977.

The time series of the Bonn Sample cover the period from 1961 to 1979. For a small subsample of corporation data of the nominal rate of return on equity are available from 1952 to 1960 as well[5]. The data of the 222 industrial corporations in the Bonn Sample are broken up as follows

Table 1 : Firms in the Bonn Sample

Branches of Industry	Number of Firms in Sample
Automobile Industry	6
Electrotechnical Industry	11
Iron and Steel Industry	9
Chemical Industry	21
Machinery Industry	28
Rest	147
Total	222

While the aggregate time series of the Federal Statistical Office permit ordinary regression analyses only, pooled regression methods are used in the analysis of the firm data in the Bonn Sample. Ordinary least squares estimates with dummy variables for the individual firms have proved to be very efficient in studying the financial data. This method will therefore be used throughout. We use this method for single equation multiple regressions as well as for the estimates of a multi-equation model of the development of the "representative manufacturing firm". This model will then be used for simulation runs which permit a better insight in the determinants of the profitability of German manufacturing

corporations and its development over time.

C. The Results

I. The Time Series

1. The Return on Capital

1.1. The Nominal Rate of Return on Capital

The nominal rate of return in the German manufacturing sector shows a marked decline over the years from 1961 to 1979 (Table 2). Profitability of total capital invested in all manufacturing corporations dropped by roughly 2o% during the two decades.

Three points merit additional emphasis. The weighted time series show a less marked decline of profitability than the unweighted figures. The bigger corporations have obviously been in a better position to defend their profitability than the smaller corporations. While the weighted data convey the impression of a rather gradual erosion of profitability the unweighted figures show more clearly that the environment, the corporations find themselves in in the seventies is rather different from the environment of the sixties. It will be shown that the oil-price hikes, the currency system of floating exchange rates and a more aggressive wages policy on the side of the trade unions are the main features that account for this difference. Finally, the overall averages hide significant industry differences. The chemical industries suffered severely from intensified international competition after the period of fixed exchange rates ended. The steel industry is hard hit by cyclical fluctuations as well as by growing structural problems. The corporations in the machinery industry which is basically an industry with medium sized firms that do not

Table 2: Nominal Rate of Return on Capital before Taxes

Year	All Corporations	Sample						
		All Corporations		Automobile	Electro technical	Steel	Chemical	Machinery
		weighted	unweighted					
1961	9.39	11.88	12.48	12.68	1o.o8	1o.49	13.88	9.31
1962	8.94	11.88	12.11	16.14	9.28	7.62	13.54	1o.42
1963	8.91	12.o3	12.2o	15.28	9.69	8.26	14.59	1o.86
1964	9.38	12.75	12.37	14.84	1o.85	8.93	14.38	9.9o
1965	9.12	11.36	11.4o	13.67	1o.93	6.62	14.o8	8.44
1966	8.32	1o.52	1o.64	12.31	9.96	7.91	12.94	6.63
1967	7.94	9.6o	1o.o8	1o.28	1o.36	4.77	11.94	7.64
1968	8.87	11.23	1o.22	12.97	9.44	6.42	13.63	6.79
1969	8.78	11.11	9.89	12.73	9.68	8.85	11.89	6.89
197o	8.48	9.35	9.54	9.o6	1o.o1	11.o1	8.97	5.75
1971	6.97	7.64	9.o9	7.64	8.11	4.54	9.4o	7.26
1972	7.41	8.73	9.o2	12.39	8.89	4.14	9.9o	6.77
1973	7.99	9.39	8.67	11.53	8.68	5.44	9.88	6.4o
1974	7.33	7.74	8.18	3.59	6.24	8.86	9.45	6.51
1975	6.41	7.53	7.67	9.78	6.55	7.72	7.o6	5.86
1976	7.9o	9.97	8.49	15.42	6.65	6.33	7.22	6.15
1977	7.15	9.47	7.71	16.55	6.19	6.38	7.79	5.96
1978	–	9.19	7.55	16.53	5.o2	5.75	8.45	5.78
1979	–	1o.31	7.49	16.12	5.23	5.46	8.24	4.92

publish financial accounts seem to have lost ground gradually
against the more flexible smaller-sized firms. The automobile
industry shows a remarkable come-back in the late seventies
after the bad years that followed the oil-price-increase in
1973 and the revaluation of the deutschmark in the early
seventies.

We now look at the <u>return on capital invested after taxes</u>.
The effective tax rate has varied considerably over time.
This is partly due to changing tax laws, partly, however,
to the fact that only part of the taxes varies with business
income, while the other is levied on business property and
fixed assets but has to be payed from firm income.

Table 3 gives the effective tax rates and the total return
after taxes for the non-financial corporations and the manu-
facturing companies. We note that the manufacturing corporations
show a higher return than the non-financial corporations despite
a higher effective tax rate. We also note that the larger
companies are more profitable than the smaller ones. Taxation
does not change the overall picture of the rate of return
before taxes.

Table 3: Nominal Rate of Return on Total Capital after Taxes

Year	Non-Financial Corporations		Manufacturing Companies		
	Effective Tax-Rate	Rate of Return	Effective Tax -Rate	Rate of Return weighted	unweighted
1961	.42	4.39	.48	5.68	5.51
1962	.43	4.29	.48	5.72	5.42
1963	.4o	4.46	.46	6.o4	5.48
1964	.4o	4.64	.5o	6.18	5.38
1965	.36	5.o3	.46	˙6.o6	5.75
1966	.34	4.85	.43	5.96	5.78
1967	.31	4.78	.35	5.96	5.27
1968	.35	4.94	.36	6.19	5.29
1969	.37	4.92	.43	6.24	5.23
197o	.33	5.42	.46	6.26	5.18
1971	.37	4.36	.48	4.91	4.88
1972	.39	4.35	.51	5.o2	4.54
1973	.36	4.89	.55	5.45	4.74
1974	.39	4.42	.56	4.o6	4.51
1975	.43	3.74	.52	4.2o	3.92
1976	.38	4.75	.54	5.71	4.81
1977	.5o	3.49	.57	4.33	3.47
1978	---	----	.53	4.o1	3.18
1979	---	----	.64	4.47	3.43
198o	---	----	---	----	----

1.2. The Real Rate of Return

Germany has a remarkable record in fighting inflation. There-
fore, the effects of inflation are not predominant in the ana-
lysis of the erosion of profitability of manufacturing com-
panies. However, there should be no question but that inflation
has a negative influence on the rate of return. In particular,
the level of profitability is certainly affected by inflation.
While in the sixties the difference between the real rate and
the nominal rate of return was about 1.5 percent on the basis
of the overall figures after taxes, the difference rose to
two percent in the seventies. The respective differences for
the firms in the Bonn Sample are 2.5 percent and 3 percent.

This means that the purchasing prices of the assets held by the
firms rose faster than the real profits of the corporations.
If the labor unions anticipate the effects of their wage demands
on the cost of living and push for wage increases that cover
not only the rise in productivity but also the anticipated
inflation rate, then clearly the entrepreneurs will try to
pass the wage burden on to their customers, and prices will
rise. However, when at the same time a revaluation of the
currency brings about intensified competition, then it becomes
increasingly difficult to recover all the increase in the wage
bill. Real profits get into a squeeze, while the current cost
of the assets owned by the firms still goes up.

Germany witnessed the first significant revaluation in 1969
and introduced floating exchange rates in 1973. Between 1969
and 1975 the trade unions pushed for a significant change in
the distribution of income with the backing of the newly
established social democratic government. These factors
account for the significant drop in the real rate of profit
on capital invested in the seventies.

Table 4 shows the development of the real rate of return on capital before taxes for German manufacturing industry. Profitability was somewhat higher in manufacturing than in all non-financial corporations in the sixties while the seventies witness a definitely smaller gap. The larger companies have recovered from the set-back caused by the revaluation of the deutsch-mark somewhat better than the smaller companies.

The recovery of real profitability in the automobile industry is most remarkable. On the other hand, the dramatic decline of real profitability in the chemical industry from 12 percent in the early sixties to 4 percent in the late seventies is rather appalling. The chemical industry has felt as much as the steel industry the decline of Germany as an industrial base for rather unsophisticated products like mass steel and basic chemical fibres.

The real rate of return on capital after taxes is defined as the rate of real profits assuming taxation permitted deduction of current cost devided by real assets at current cost. Of course, such a figure is purely hypothetical because it assumes "real" taxation throughout (neither current taxes on nominal profits nor deferred taxes on profits of "sale" of assets at current cost), but may be used as an indicator for the real interest rate after taxes. Table 5 presents the raw data for the period from 1961 to 1979.

Table 4:   Real Rate of Return on Capital before Taxes

Year	Non-Financial Corporations	Manufacturing Corporations		Branches of Industry				
		weighted	unweighted	Automobile	Electro-technical	Steel	Chemical	Machinery
1961	7.98	9.79	1o.4o	1o.27	8.53	8.82	11.85	7.44
1962	7.o8	9.39	9.67	12.56	7.29	5.86	11.1o	8.42
1963	7.13	9.71	9.93	12.25	7.77	6.45	11.92	8.98
1964	7.57	1o.71	9.47	11.53	8.54	6.58	11.99	7.49
1965	7.26	8.81	8.57	1o.54	8.55	5.14	11.64	6.17
1966	6.6o	8.12	7.83	9.68	7.9o	5.71	1o.5o	4.56
1967	6.51	8.25	9.93	9.o8	9.54	3.93	1o.78	6.83
1968	7.26	1o.o9	9.71	11.65	9.o4	5.34	15.44	6.21
1969	6.95	8.78	7.3o	1o.34	8.o2	6.28	9.2o	5.13
197o	6.15	6.o9	6.14	5.38	7.16	7.o8	5.45	3.21
1971	4.59	4.26	5.4o	3.65	5.14	1.4o	4.95	4.43
1972	5.o6	5.5o	5.65	8.oo	6.21	1.65	5.15	3.92
1973	5.63	5.15	4.o1	6.38	5.o2	.27	4.82	2.56
1974	4.93	1.73	1.34	− 4.22	.65	2.33	− .39	.51
1975	4.o7	4.15	4.19	5.61	3.75	4.57	2.3o	2.71
1976	5.5o	6.18	4.29	1o.25	3.63	2.78	2.96	2.97
1977	4.94	6.42	4.52	12.13	3.82	3.57	4.35	3.4o
1978	----	6.62	4.71	12.73	3.21	3.3o	4.96	3.83
1979	----	6.37	3.45	11.o4	.79	2.51	3.52	1.26
198o								

Table 5:   Real Rate of Return on Capital after Taxes

Year	Non-Financial Corporations	Manufacturing Corporations		Branches of Industry				
		weighted	unweighted	Automobile	Electro-technical	Steel	Chemical	Machinery
1961	3.28	3.88	3.82	3.41	3.48	3.58	4.68	2.55
1962	2.83	3.66	3.48	3.85	3.15	2.17	4.36	3.06
1963	3.07	4.15	3.75	4.65	3.47	2.36	4.70	3.50
1964	3.24	4.04	3.17	3.61	3.27	1.66	4.79	2.27
1965	3.55	3.88	3.46	4.16	3.62	1.50	4.68	2.02
1966	3.43	3.87	3.43	3.86	3.91	3.06	5.06	1.49
1967	3.58	4.82	4.94	4.93	6.04	2.06	5.43	3.74
1968	3.66	5.36	5.01	5.22	5.09	3.07	9.26	3.45
1969	3.46	4.22	3.06	4.37	3.96	3.34	3.79	2.87
1970	3.44	3.25	2.15	1.62	3.73	3.56	1.83	1.13
1971	2.30	1.79	1.67	.52	2.42	.21	1.11	2.42
1972	2.39	2.15	1.70	2.53	2.64	.57	1.39	1.65
1973	2.89	1.57	0.43	1.47	1.77	-1.43	.79	.41
1974	2.37	- 1.59	- 2.23	- 7.00	- 1.92	- .67	- 4.17	- 1.23
1975	1.73	1.15	.69	1.01	1.37	1.79	- .87	.74
1976	2.73	2.33	.90	3.77	1.04	.77	- .44	.33
1977	1.73	1.77	.76	2.94	1.27	1.33	.83	.42
1978	----	1.90	.87	3.47	1.29	1.20	1.95	1.16
1979	----	1.09	- .11	1.79	- 1.11	.85	.09	- 1.19
1980								

In order to understand the development shown in the first three
columns one has to keep in mind that

- the non-manufacturing companies, particularly
  trade and transportation and services, in the
  the group of non-financial corporations of
  column 1 had significantly higher profits in
  1974 than the manufacturing companies.

- obviously the oil-price increase and the end of the
  system of Bretton Woods affected the manufacturing
  companies earlier and more severely than the non-
  producing corporations.

- the smaller companies in the sample of manufacturing
  companies have a lower real profitability than the
  larger ones. They were affected by the change in the
  economic climate after 1973 more severely than the
  bigger companies.

The most noteworthy developments in the different branches of
industry are

- the chemical industry suffered a severe drop
  in real profitability after the revaluation of
  the deutschmark in 1969. It has not recovered
  from the set-back caused by the revaluation of
  the deutschmark yet.

- the automobile industry had a very bad start into
  the seventies, but had a remarkable recovery in
  the late seventies.

- the figures for the machinery industry may not be
  very representative. Particularly in the period
  from 1969 on the coefficients of variation consist-
  ently exceed 1oo percent and in years of recession
  they have gone up to almost 6oo percent thus indi-
  cating a wide range of profitability of different
  firms in this industry.

1.3. Market Valuation of the Profitability of Capital Invested

When purchasing prices for the real assets of a company rise faster than profits, then clearly we have a growing divergence between total current cost of the company and its net present value derived from the stream of future earnings. If we assume that the market values companies according to their net present value, then clearly we would expect the ratio of its market value to its current cost value to be below 1 and to decline. This ratio is called Tobin's Q.

Table 6 shows that Tobin's Q has been way below 1 for all non-financial corporations in Germany ever since 1961. For the manufacturing companies, however, Tobin's Q was above 1 in the first half of the sixties, around 1 in the late sixties and early seventies and definitely below 1 since 1974. Since the nominal rate of return of the companies in the sample was higher than the rate of return of all non-financial corporations until about 1969, it should not be surprising that Tobin's Q is higher for that period. However, since the rate of return was about the same from 1970 onward, a lower Q can only be attributed to a relatively higher market valuation of the manufacturing companies per unit of current cost than for all the non-financial corporations. This would mean that the cost of capital after taxes should be higher for the non-financial corporations than for the group of manufacturing firms.

The cost of capital after taxes is defined as profits after tax plus interest payments devided by the market value of total capital invested. Table 6 gives the annual figures. In fact, the cost of capital has been consistently lower for the manufacturing firms in the sample than for all non-financial corporations.

Table 6: The Market Valuation of the Rate of Return

Year	Non-Financial Corporations				Manufacturing Corporations in the Bonn Sample				
	Cost of Capital after Taxes	Return to Investors	Tobin's Q	Interest Rate Paid	Cost of Capital after Taxes	Return to Investors	Tobin's Q	Dividend Rate	Interest Rate Paid
1961	4.6o	3.94	.64	2.4o	3.32	2.78	1.39	.8o	2.16
1962	4.84	4.22	.57	2.48	3.91	3.25	1.o9	.8o	2.32
1963	5.o4	4.33	.57	2.63	3.8o	3.o4	1.1o	.78	2.33
1964	5.o9	4.27	.58	2.62	3.58	2.93	1.o9	.78	2.23
1965	5.69	4.28	.57	2.73	4.39	3.23	.97	.75	2.47
1966	5.73	4.49	.55	3.oo	4.8o	3.75	.86	.74	2.95
1967	5.63	4.63	.55	3.16	4.13	3.36	.95	.77	2.79
1968	5.43	4.3o	.59	2.9o	3.88	3.o8	.99	.77	2.44
1969	5.26	4.47	.62	2.93	3.49	2.85	1.14	.78	2.57
197o	5.95	4.72	.61	3.47	3.82	3.49	1.o1	.79	3.39
1971	4.75	4.34	.6o	3.46	3.62	3.25	.99	.8o	3.23
1972	4.61	3.87	.61	3.12	3.o1	2.66	1.11	.78	2.77
1973	5.25	4.54	.61	3.67	3.44	3.29	1.o5	.82	3.69
1974	4.93	4.65	.59	3.93	3.7o	3.79	.92	.84	4.21
1975	4.o5	3.9o	.61	3.45	2.77	3.o8	.94	.8o	3.53
1976	5.o4	4.o8	.63	2.89	3.93	2.95	.92	.75	2.76
1977	3.72	3.37	.63	2.89	2.88	2.69	.91	.79	2.73
1978	----	----	---	----	5.14	4.7o	.49	.77	2.5o
1979	----	----	---	----	2.86	2.63	.91	.76	2.57
198o									

The manufacturing firms' cost of capital has decreased relative
to the non-financial corporations. At the same time, the return
to investors paid by the manufacturing firms increased relative
to the non-financial corporations. The manufacturing firms have
obviously stemmed a decline in the market valuation of their
shares by increasing their dividend rate more than all the
non-financial corporations. Since interest rates actually payed
by the manufacturing firms were, with three exceptions, lower
than those of all the firms, using leverage in order to reduce
the costs of capital may have seemed a promising way to keep
the cost of capital down - if, of course, the equity owners
did not account adequately for the risk involved in such a
policy.

2. The Return on Equity

2.1. The Nominal Rate of Return

The rate of return on equity is first computed as the ratio of
profits after taxes divided by the book-value of equity inclu-
ding reserves. From table 7 we note that the manufacturing
corporations have had a higher rate of return on equity than
the non-financial corporations throughout the period. This is
not in contrast to the picture gained from the data on the
profitability of total capital invested.

However, while the weighted average of the total return is
smaller, the return on equity is higher in the case of the weighted
averages than in the case of the unweighted averages with the
exception of the early seventies. The larger companies have
used leverage to bring about this result.

Table 7: Nominal Rate of Return on Equity

Year	All Non-Financial Corporations	All Manufacturing Corporations		Branches of Industry				
		weighted	unweighted	Automobile	Electro-technical	Steel	Chemical	Machinery
1961	7.96	11.o8	11.o8	16.62	1o.17	9.69	1o.75	1o.27
1962	7.63	1o.97	1o.84	21.1o	1o.1o	6.1o	1o.64	11.89
1963	7.87	11.76	1o.58	21.2o	1o.o7	6.11	11.6o	12.36
1964	8.45	12.18	1o.25	13.33	1o.51	5.17	12.1o	1o.34
1965	9.32	11.44	1o.89	13.19	11.78	3.23	12.89	8.99
1966	8.15	1o.32	1o.15	1o.83	11.33	6.17	12.34	7.o3
1967	7.59	1o.23	9.2o	9.41	15.33	.o1	9.85	1o.52
1968	8.5o	11.o8	9.74	11.o6	11.o9	5.57	12.91	9.o5
1969	8.76	11.49	9.76	13.94	11.82	1o.17	1o.9o	1o.72
1970	9.35	1o.82	8.29	9.31	13.34	13.84	6.27	6.89
1971	6.23	6.84	8.34	7.44	9.78	1.o3	7.24	9.67
1972	6.97	8.26	9.o7	13.o3	11.3o	.9o	8.34	7.45
1973	7.6o	8.8o	7.17	12.95	1o.74	3.91	8.46	5.14
1974	5.57	4.55	5.9o	-4.95	9.9o	4.96	8.25	5.2o
1975	4.41	5.73	7.55	7.4o	4.52	5.98	4.31	3.69
1976	9.16	11.48	1o.81	22.25	1o.1o	4.48	7.94	6.42
1977	4.93	7.53	4.89	16.65	3.88	2.66	5.71	5.39
1978	----	6.84	5.36	17.25	1.92	.o2	7.61	4.59
1979	----	8.75	6.16	16.63	8.1o	1.39	6.92	3.56
1980								

Figure 1

The Nominal Rate of Return on Equity

All Manufact. Corp.,
weighted

3o largest Manufact.
Corp.

All Manufact. Corp.
unweighted

All Non-Financing
Corp.

3o smalest Manufact.
Corp.

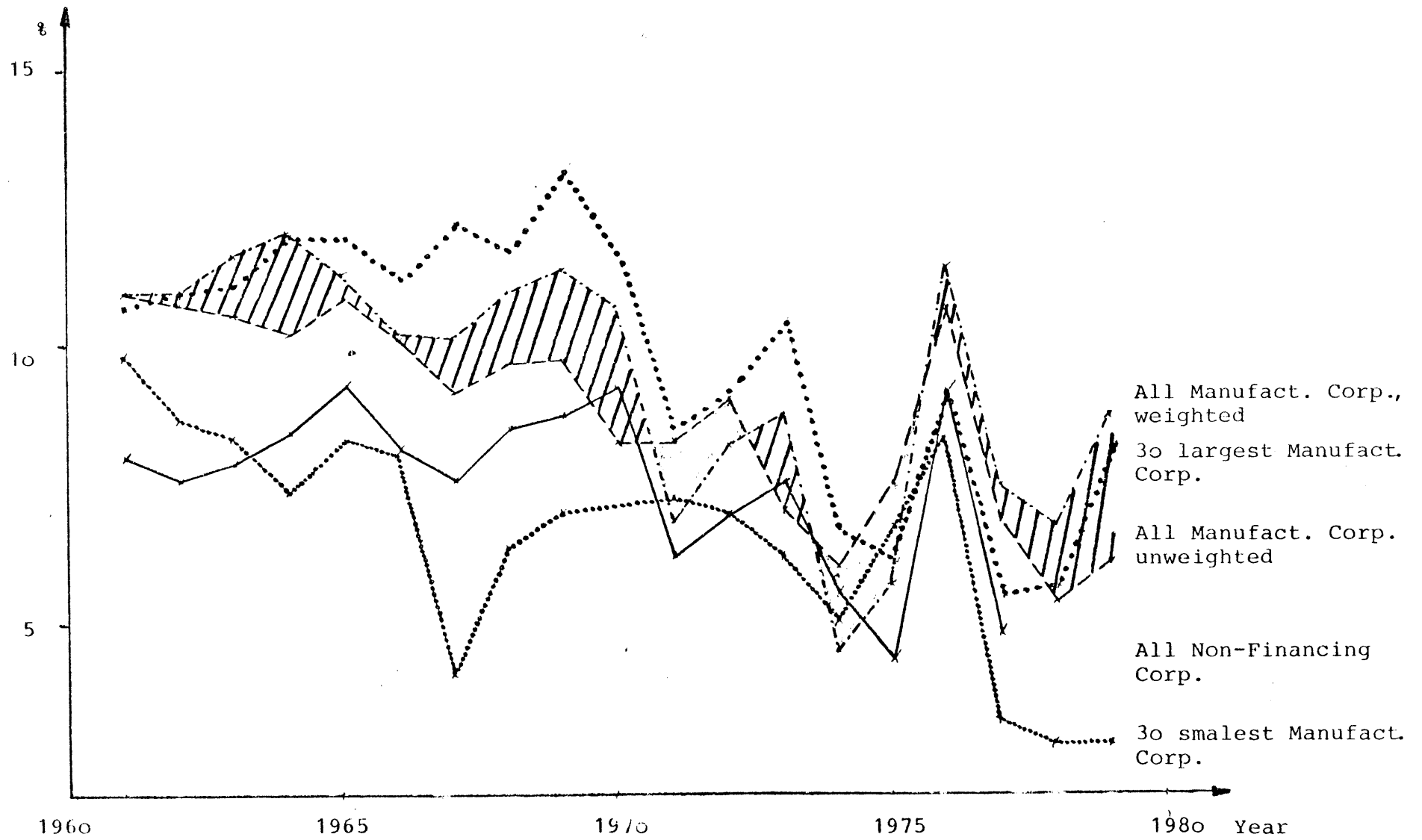1960   1965   1970   1975   1980   Year

Table 8:　　　Real Rate of Return on Equity before Taxes

| Year | Non-Financial Corporations | Manufacturing Corporations | | Gearing[1] | |
		weighted	unweighted	Non-Financial Corporations	Manufacturing Companies
1961	17.o9	21.5o	24.25	2.14	2.2o
1962	14.53	19.85	22.17	2.o5	2.11
1963	14.59	2o.37	21.58	2.o5	2.1o
1964	15.67	22.o4	2o.88	2.o7	2.17
1965	14.55	18.33	19.59	2.oo	2.o8
1966	12.29	15.97	16.89	1.86	1.97
1967	11.75	14.9o	16.71	1.8o	1.81
1968	13.68	18.85	18.57	1.88	1.87
1969	13.43	17.88	16.oo	1.93	2.o4
197o	1o.81	12.15	12.48	1.76	2.oo
1971	7.12	7.47	11.26	1.55	1.75
1972	8.8o	1o.92	14.67	1.74	1.99
1973	9.56	11.59	1o.49	1.7o	2.25
1974	7.45	7.28	6.54	1.51	4.21
1975	5.88	7.9o	1o.24	1.44	1.9o
1976	1o.46	14.26	11.59	1.9o	2.31
1977	8.84	13.56	8.95	1.79	2.11
1978	-----	13.66	8.88	----	2.o6
1979	-----	15.74	9.49	----	2.47
198o					

1) Gearing - real rate of return on equity to real rate of return on total capital

The 3o largest corporations in the sample increased their debt-ratio   from   1.78 to 2.45 while the 3o smallest corporations in the sample increased it from 1.27 to 1.94. In the early seventies the larger firms have obviously had more difficulty to adjust to a changed and more hostile environment than the smaller companies. They had a higher share of exports in their total sales and were thus exposed to the disadvantageous effects of the revaluation of the deutschmark to a greater extent than the smaller companies.

Figure 1 adds to the data of table 7 figures on the rate of return on equity among the 3o smallest and the 3o largest corporations in the sample. It seems interesting to note that the medium-sized corporations have obviously been quicker to adjust to the new economic situation than either the largest or the smallest corporations.

2.2. The Real Rate of Return on Equity

The real rate of return on equity is defined as the ratio of real profits before taxes divided by the real value of equity. Table 8 provides the data for the non-financial and for the manufacturing corporations. It seems that while the smaller companies have done better in periods of low inflation rates the larger companies have been in a better position to keep up with inflation. Of course, they are in a better position to pass on cost increases to their customers than the smaller companies.

Gearing is defined as the real rate of return on equity divided by the real rate of return on total capital. Table 8 shows that while for all non-financial corporations there was a marked drop from the early sixties   to the early seventies with a minor recovery only in the late seventies, the manufacturing corporations seem on the whole to have been able to keep gearing

virtually at the same level throughout the period.

The problems of defining a real rate of return on equity after taxes are well-known to financial analysts. We define the real rate of return on equity as real profits before taxes minus actual taxes divided by the real value of equity. For detail the reader is referred to appendix 2. Table 9 presents the data for the non-financial corporations as well as for the manufacturing companies in the Bonn Sample. ·

It should be interesting to note that since 1971 the real rate of return on equity after taxes has been lower than the real rate of return on total capital after taxes for the non-financial corporations, and that this relation holds true for several years in the seventies for manufacturing companies as well. Obviously investment in shares has become a proposition with returns that   are no longer in keeping with the risks involved.

2.3. The Market Valuation of the Return on Equity

While the nominal and the real rates of return reflect current profits on the current valuation of the firms' assets, the stock-exchange, of course, reflects the investors' valuation of the company's future earnings power. It seems interesting to compare the nominal and the real rates of return with the market valuation of the return on equity. This ratio is defined as profits after taxes divided by the market valuation of the total shares outstanding (excluding preferred stock which is not treated as credits).

Figure 2 shows the development of the three time-series. The decline in the nominal and the real rates of return on equity is not reflected in the market valuation. During the sixties the market held expectations of growth in earnings. The share-prices reflected these expectations, and the price-earnings-ratios

Table 9: Real Rate of Return on Equity after Taxes

| Year | Non-Financial Corporations | Manufacturing Companies | | | | | | |
| | | All Companies | | Branches of Industry | | | | |
		weighted	unweighted	Automobile	Electro-technical	Steel	Chemical	Machinery
1961	5.19	7.45	7.4o	1o.78	7.1o	6.69	7.59	6.o1
1962	4.13	6.66	6.44	11.32	6.o5	3.15	6.96	7.42
1963	4.47	7.38	6.53	12.o6	6.o9	3.o5	7.67	7.97
1964	4.92	7.84	5.8o	7.68	6.29	2.25	8.14	5.87
1965	5.47	7.18	6.38	8.35	7.o3	1.81	8.5o	4.69
1966	4.66	6.41	5.76	6.87	7.19	3.44	8.o9	3.23
1967	4.65	7.o9	6.21	6.79	12.o9	- .79	7.55	7.55
1968	5.o9	8.23	8.o4	7.98	8.67	3.14	16.85	5.93
1969	4.76	7.23	5.37	9.44	8.o2	5.33	6.12	6.38
1970	4.13	5.23	3.36	3.84	7.53	6.49	1.89	1.32
1971	1.51	1.52	2.39	1.78	3.92	-1.89	1.42	4.o3
1972	2.19	2.87	4.7o	5.99	5.66	-1.13	1.97	2.42
1973	2.59	2.84	1.56	5.91	5.1o	.97	1.71	.61
1974	.83	-1.24	- .71	-5.93	3.16	.22	-1.5o	- .41
1975	- .1o	.36	2.34	1.11	- .34	1.36	÷2.28	- .87
1976	3.17	4.55	3.o1	1o.35	1.47	- .28	.94	.24
1977	.49	1.75	- .25	6.29	- .41	-1.29	.74	- .o2
1978	----	1.59	.11	7.11	-2.11	-2.67	2.36	.o6
1979	----	2.45	.42	6.84	.27	-1.31	.83	- .91
1980								

were high. The market rate of return on equity was below the
real rate of return on equity.

Since

$$(1) \quad RR = \frac{RP}{RE} \quad ,$$

and

$$(2) \quad MR = \frac{NP}{ME} \quad ,$$

$$RR > MR \quad \text{implies}$$

$$(3) \quad Q > \frac{NP}{RP} \quad \text{with Tobin's Q defined by}$$

$$(4) \quad Q = \frac{ME}{RE}$$

The symbols are

RR - real rate of return

RP - real profit

RE - real equity

MR - market rate of profit

NP - nominal profit

ME - market valuation of equity.

Of course, NP/RP > 1 in times of inflation so that (3) certainly
implies Q > 1. When MR > RR, then, of course,

$$(5) \quad Q < \frac{NP}{RP}$$

which does not necessarily imply in all instances that Tobin's Q
is smaller than 1. Figure 2 corroborates our previous findings
that relatively speaking Tobin's Q was larger than 1 during the
sixties and smaller than 1 during the seventies. Furthermore,
the gap between the market rate of return and the nominal rate of
return seems to get narrower. This would imply that not only
does the market no longer see a profit potential beyond that
implied by the historical cost of the assets of the companies
but also do investors no longer identify hidden valuation reserves
in the book-values of equity capital.

Figure 2

Rate of Return on Equtity

Nominal Rate of
Return on Equity

Market Rate of
Return on Equity

Real Rate of
Return on Equity

%

1965   1970   1975   1980   Year

2.4. Leverage and the Rate of Return on Equity

It is asserted in the literature on business finance that as
long as the rate of return on total capital is higher than
the interest rate on debt capital, a decrease in the rate of
return on capital invested can be offset by increasing leverage.
Table 1o shows that the difference between the rate of return on
capital invested and effective interest rate remains positive
throughout and that the debt-equity-ratio increased over the
period. Thus the gradual decrease in the rate of return on total
capital was partly offset.

However, the difference between the rate of return and the
effective interest rate, the so-called leverage factor, became
smaller and smaller. In order to keep the difference between
the rate of return on equity and the rate of return on total
capital constant, the debt-equity-ratio would have had to be
7.1 instead of 2.2 in 1979. This, of course, was certainly not
feasible. The risks of using leverage to increase the rate of
return on equity become the greater, the more the leverage
factor decreases. This is easily seen when we use the well-known
leverage equation

$$(6) \quad NRE = NRT + (NRT - EIR)DER$$

to derive the first differences

$$(7) \quad \Delta NRE = \Delta NRT + (NRT - EIR)\Delta DER +$$
$$(\Delta NRT - \Delta EIR)DER$$

NRE - nominal rate of return on equity
NRT - nominal rate of return on total capital
EIR - effective interest rate
DER - debt-equity-ratio
Δ - indicator of annual change

If the leverage factor in the second summand is small,
additional debt financing does not help to stem the tide
of decreasing profitability of total capital. On the other hand,
if interest rates rise due to rising inflation and the profitab-
ility of capital decreases, then the change in leverage reduces
the rate of return on equity much more severely. The higher
the prevailing debt -equity -ratio, the more important is this
negative leverage effect.

Table 1o shows actual changes in the rate of return on equity
and the changes computed from equation (7) using the data in table
1o. The two columns cannot be identical of course because they
are computed from data of the individual companies. The direction
of change is, however, computed wrongly twice only if we take
the changes in the unweighted and the weighted averages jointly
as a basis for comparison (1972 and 1979). The years of 1966
and 1973 are particularly interesting. While total return on
capital invested rises slightly, the rate of return on equity
declines sharply because the change in the interest rate far
exceeds the change in the rate of return of total capital in-
vested.

Table 1o: Leverage and the Rate of Return

Year	Change in the Rate of Return on Equity	Change in the Rate of Return on Total Capital	Difference between Rate of Return and Effective Interest Rate (Leverage Factor)	Change in the Debt-Equity-Ratio	Difference between Change of Rate of Return and Change of Effective Interest Rate	Debt Equity Ratio	Computed Change in the Rate of Return on Equity (Unweighted Data)	Change in the Rate of Return on Equity (Weighted Data)
1961	-----	-----	3.35	----	-----	1.52	-----	-----
1962	-o.24	-o.o9	3.1o	o.o3	-o.25	1.55	-o.2o	-o.11
1963	-o.26	+o.o6	3.15	o.oo	+o.o5	1.55	+o.14	+o.79
1964	-o.33	-o.1o	3.15	o.o4	o.oo	1.59	+o.o3	+o.42
1965	+o.64	+o.37	3.28	o.o4	o.12	1.63	+o.7o	-o.72
1966	-o.74	+o.o3	2.8o	-o.o3	-o.48	1.6o	-o.77	-o.12
1967	-o.95	-o.51	2.48	-o.o4	-o.32	1.56	-1.16	-o.o9
1968	+o.54	+o.o2	2.85	o.o2	+o.37	1.58	+o.66	+o.85
1969	+o.o2	-o.o6	2.66	o.12	-o.19	1.7o	-o.o6	+o.41
197o	-1.47	-o.o5	1.79	o.16	-o.87	1.86	-1.38	-o.67
1971	+o.o5	-o.3o	1.65	o.o6	-o.14	1.92	-o.47	-3.98
1972	+o.73	-o.34	1.77	o.o4	+o.12	1.96	-o.o3	+1.42
1973	-1.9o	+o.2o	1.o5	o.o7	-o.72	2.o3	-1.22	+o.54
1974	-1.27	-o.23	o.3o	o.o4	-o.75	2.o7	-1.77	-4.25
1975	+1.65	-o.59	o.39	-o.o1	+o.o9	2.o6	-o.41	+1.18
1976	+3.26	+o.89	2.o5	o.o4	+1.66	2.1o	+4.46	+5.75
1977	-5.92	-1.34	o.74	-o.o2	-1.31	2.o8	-4.o8	-3.95
1978	+o.47	-o.29	o.68	o.oo	-o.o6	2.o8	-o.41	-o.69
1979	+o.8o	+o.25	o.86	o.1o	+o.18	2.18	+o.73	+1.91
198o								

3. The Determinants of the Rate of Return

Three factors seem to dominate the explanation of the development of the rate of return of German manufacturing companies:

- the increased intensity of competition
  due to the revaluation of the deutschmark
  and the price increase for imported raw materials
  like oil and mineral ores,

- the tougher bargaining processes resulting in an
  effectively higher wage share of firm income,

- the successful attempts on the side of creditors
  to shelter credit from erosion by inflation through
  higher nominal interest rates (as well as through shorter
  amortization periods).

In this section we will take these three determinants up and look a little closer at their impact on the profitability of the firms.

3.1. Rates of Return and Business Risk

On an imperfect market intensified competition will result in a wider-spread of rates of return because while some firms gain a competitive edge on their competitiors, other hold back temporarily and have to intensify their efforts to catch up with the market leaders. The coefficient of variation of the rates of return among the 222 firms in the sample may therefore be used as an indicator of the risk of the market place. We will call this risk the business risk. It has to be borne in mind, however, that the actual data derived from the financial reports represent the net effect of the market risk on the one hand and of the effects of measures taken by the companies to reduce this risk by e.g. diversification and shifting the asset structure of the portfolio to less risky assets on the other.

From Figure 3 we infer that while the average rate of return among the manufacturing companies in Germany declined over time, business risk has increased somewhat if we look at the rates of return before taxes. Taxation has had a double effect. On the one hand it has cushioned the decline in the rate of return. On average, the government shouldered the burden of the loss and profitability with the firms. On the other hand, however, taxation increased business risk. The coefficient of variation increased significantly between 1961 and 1979. There are cyclical influences that account for the deviations from the general trend. But the structural changes that have brought about lower profitability and higher risk are nontheless evident.

Figure 4 presents the data on the real rate of return and on the coefficient of variation. Again the cyclical pattern is evident and in fact much more pronounced than in the case of the nominal data. On the other hand figure 4 conveys the impression of a structural break between the early sixties until 1966 and the latter part of the period under investigation. The central of gravity of the return-risk-profile has certainly shifted downward to the right.

The data we have presented so far indicate that the drop in the rate of return of German manufacturing companies reflects a significant structural change in economic climate. Adaptation to the new environment is a slow process, and obviously some companies, particularly the larger ones, though more seriously affected in the first place, have been able to adapt faster than others. We will now try to point out some indicators of changes in corporate policy that have taken place in order to meet the greater risks of the market place in the seventies.

Figure 3: Nominal Rate of Return on Total Capital
         and Business Risk

Figure 4: Real Rate of Return on Total Capital
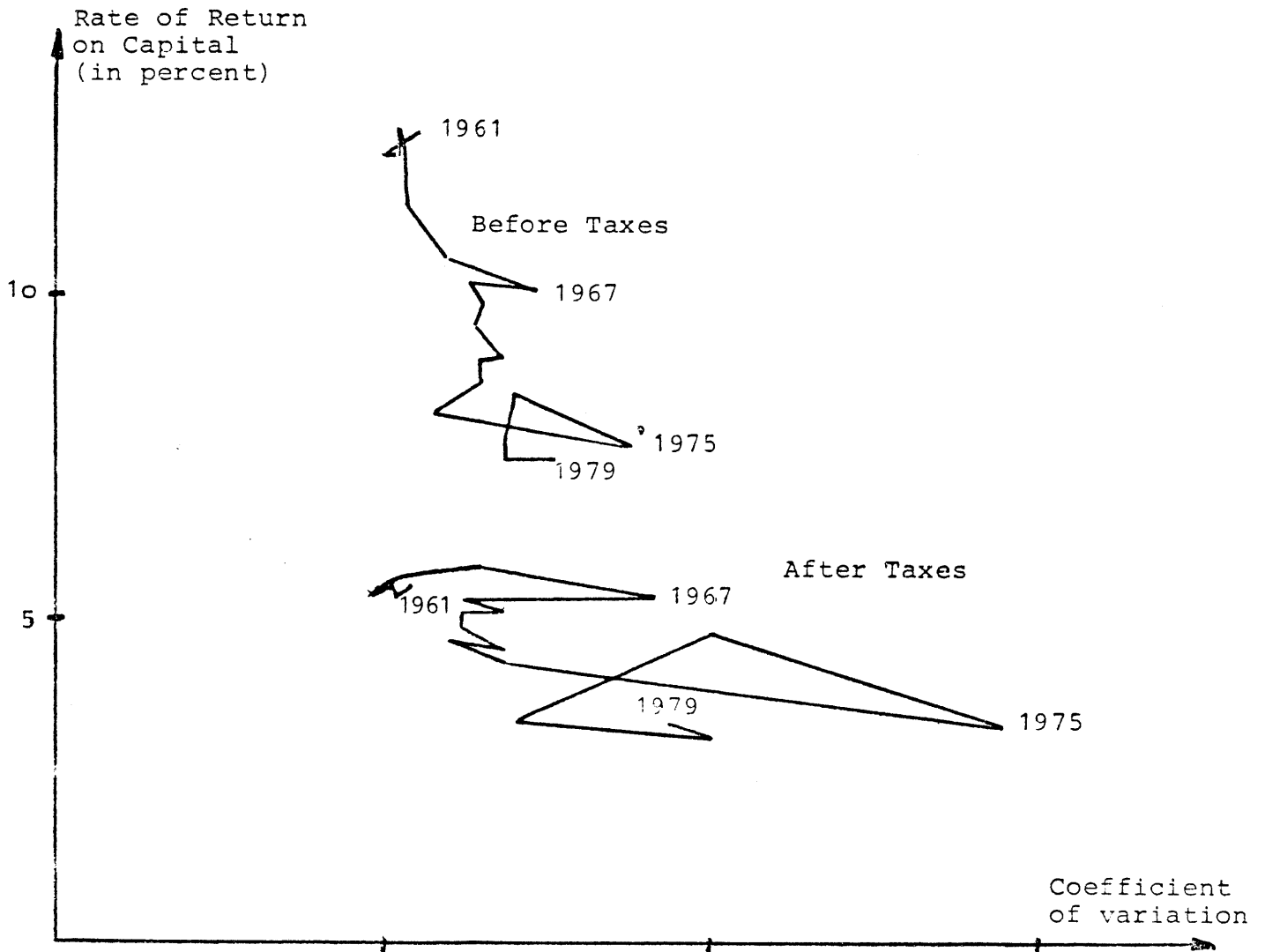and Business Risk
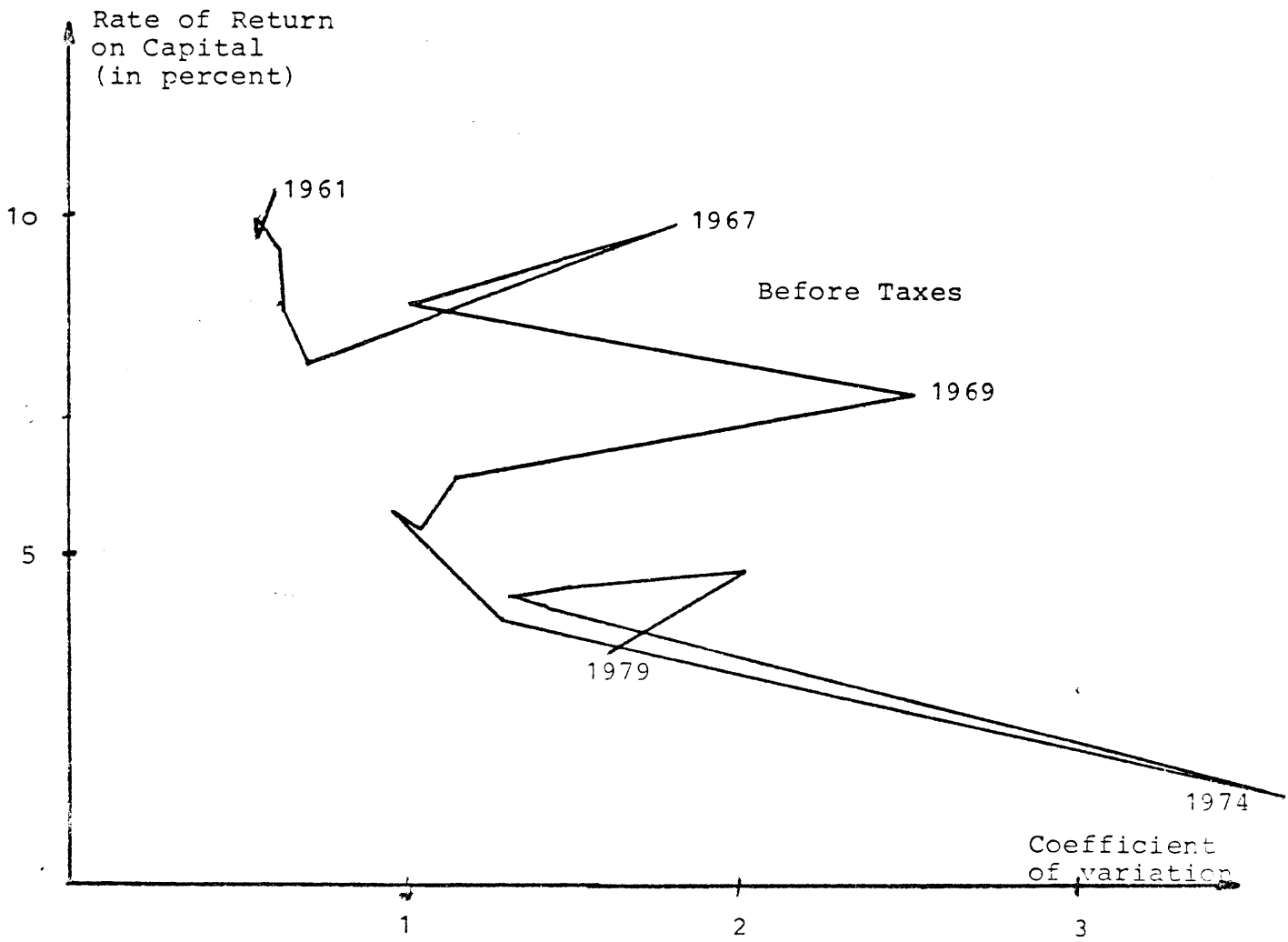
Figure 5: Ratios of Portfolio Decisions
German Manufacturing Corporations

Cash and Bank Deposits to Fixed Assets
3o largest

Fixed Assets to Total Assets

Financial Assets to Total
Assets, 3o largest

Investment in Plant and Equip-
ment to Plant and Equipment

Cash and Bank Deposits
to Fixed Assets, 3o smallest

Financial Assets to Total
Assets, 3o smallest
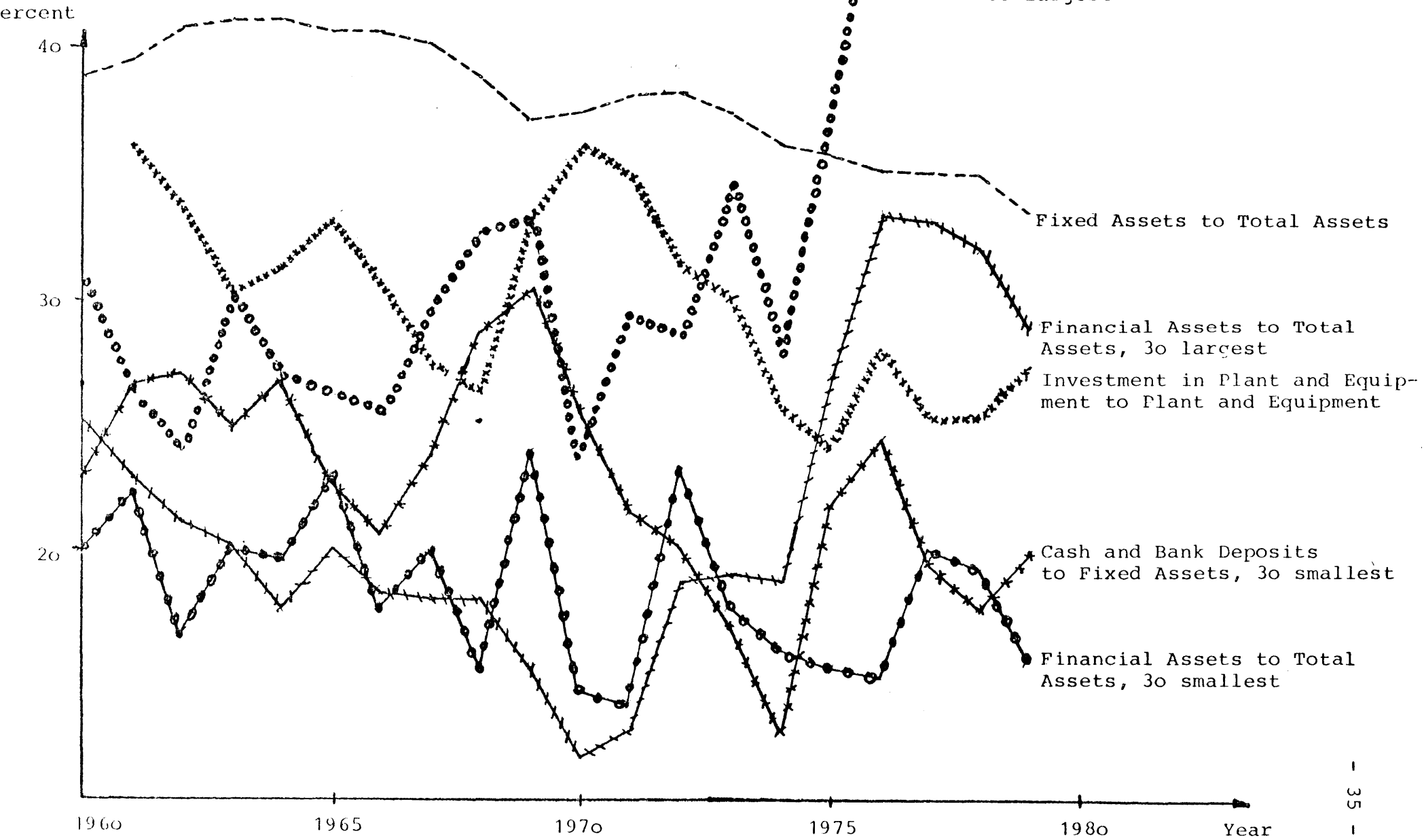
First, investment in plant and equipment was reduced significantly
after 197o. This led to a marked decline of the ratio of fixed
assets to total assets. This shift in the composition of the
business portfolio may not only be interpreted as a reaction
towards less favorable business conditions profitwise   but also
as an attempt to reduce business risk.

Secondly, there is a marked increase in the proportion of
financial and liquid assets in the investment portfolio of
the largest manufacturing corporations since 197o. The smaller
companies, on the other hand, could not shift their assets to
holding liquid assets because, obviously they were under heavier
financial constraints. Part of the success of adaptation of the
larger companies to the changed economic environment may be
attributed to their effective policy of investment in financial   .
assets rather than in plant and equipment located in Germany.
I would interpret these figures to mean that German corpor-
ations have not responded to increased   risk in the environ-
ment by an increased risk preference but rather by intensi-
fied attempts at diversification abroad and at holding a larger
share of risk-free assets.

Figure 5 gives an indication of the portfolio decisions of
German manufacturing corporations which were taken in order to
cope with the increased business risk of the seventies.

3.2. Rate of Return and Financial Risk

Attempts to limit business risk may not have been completely
voluntary acts of management. They may have been imposed on
the companies by their investors.

We first look at the stock-holders. No empirical study of risk
preference among German stock-holders has been carried out
so far. We use a very crude approach here. We make the heroic

Figure 6: Risk Profiles of Stocks and Bonds
1968 - 1979
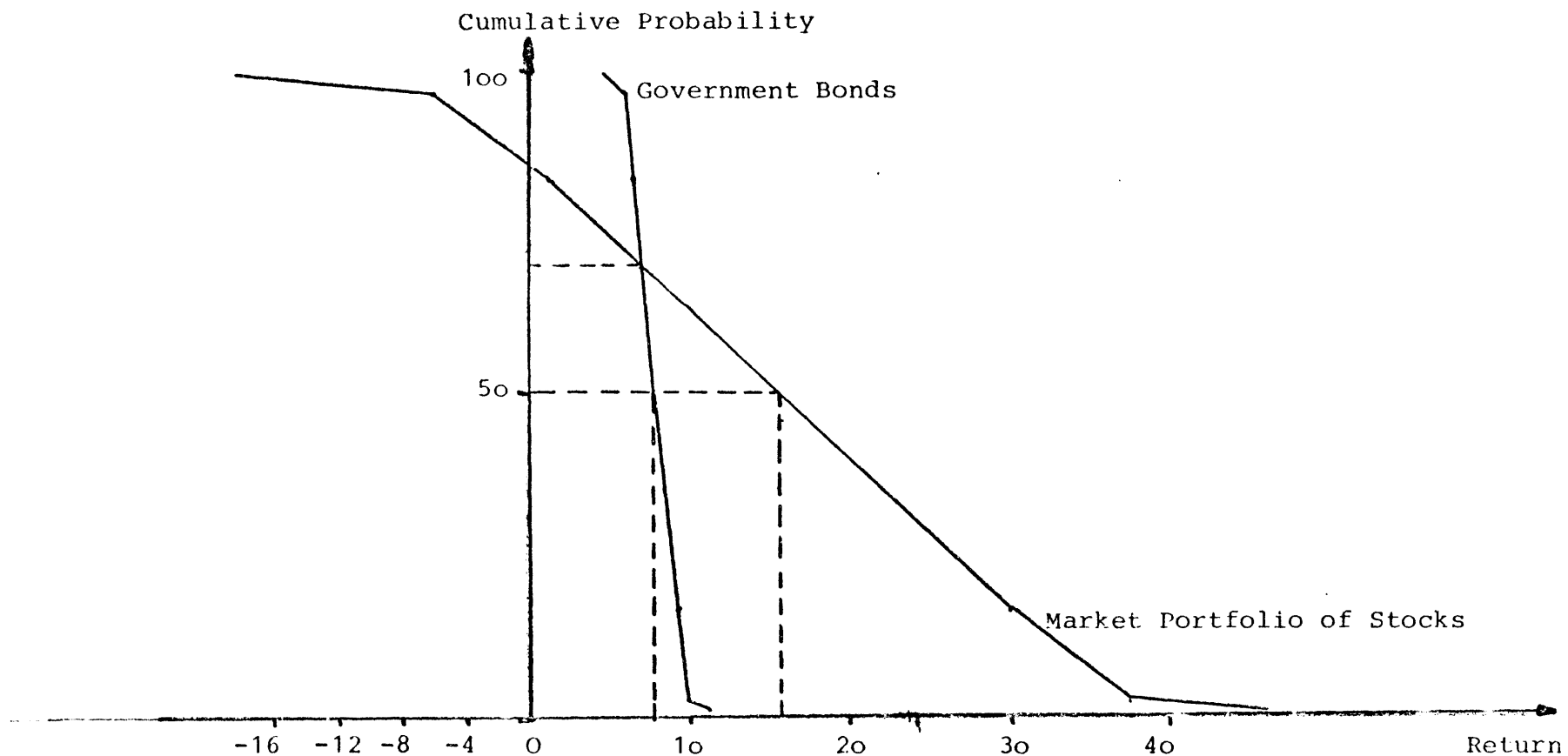
assumption that an investor could have forecast the returns
from a market portfolio of stocks correctly for the years
from 1968 to 1977 and that he was faced with the alternative
to invest in government-bonds with a known distribution of
yields. He could therefore have invested in an (almost) safe
asset (bonds) with an expected return of 8 percent or a
risky asset (stocks) with an expected return of nearly 16 percent.
The standard deviation was 1.3 on the bonds and 14.4 on the
stocks. The statistical test shows that the returns from the
stocks were normally distributed. The risk profiles the in-
vestor was faced with are shown in figure 6. The risk-premium
on risky assets was about 8 percent. This was the price for
a 3o percent chance of doing worse than by investing in bonds
and for a 14 percent chance to lose money. Taking into con-
sideration also that there was a 6 percent chance of making
more than 1o percent on bonds and a 5 percent chance of making
more than 36 percent on stocks, one might well agree with obser-
vers of the German stock-exchange that there is a high risk
aversion among share-holders. Declining profits on capital
invested made it increasingly difficult for the firms to
meet the expectations of investors for risk-premia. Therefore
the firms may have been forced to stabilize returns and to
invest in less risky and at the same time less profitable in-
vestments.

Financial risk is not limited to share-holders. Creditors also
bear financial risk. Let us measure financial risk by the probab-
ility that the cash flow in any period t does not cover interest
on and amortization of the loan, $(1-\pi)$. Thus

(8) $\Pr \{ C_t \leq i_t + \frac{L}{D} \} = 1 - \pi$

with C_t – cash flow from investment in period t,
            a stochastic variable,

i_t – interest payment

L – nominal value of loan

D – Duration of credit contract

π – (cumulative) probability

The certainty equivalent for (8) is

$$(9) \quad \bar{C}_t - \lambda(\pi) \, \sigma_t = i_t + \frac{L}{D}$$

with a bar denoting expected values and λ the normal deviate of the standard normal distribution. In (9) σ_t measures business risk. We assume σ_t to be an exogenous variable attached to the type of equipment purchased.

We now relate financial risk, $1 - \pi$, to financial structure. Let α denote the debt ratio. The equilibrium of demand and supply for funds is given by

$$(10) \quad I = E + L = E + \alpha I$$

with

      I - investment outlay

      E - equity capital.

Now setting

$$(11) \quad \bar{C}_t = \frac{N + 1 - t}{N} \, \bar{C}_1 \quad ,$$

$$(12) \quad \bar{C}_1 = \gamma \cdot I$$

and

$$(13) \quad i_t = r \cdot \alpha I \left(\frac{D + 1 - t}{D} \right)$$

with

      r - interest rate

      N - economic life time of investment,

we have from (9) and (1o) after rearranging

$$(14) \quad \frac{\sigma_t}{I} = \frac{N - t + 1}{N} \cdot \frac{\gamma}{\lambda} - \frac{\alpha}{\lambda} \cdot \frac{1}{D} \left[1 + r (D - t + 1) \right]$$

or simplifying

$$(14') \quad \frac{\sigma_t}{I} = \frac{1}{\lambda} \left[A \cdot \gamma - \alpha B \right]$$

For given business risk the debt ratio is a linear function of financial risk. The debt ratio is therefore a measure of financial risk. For given business risk (14) specifies the maximum credit limit. Or conversely, for given credit limits (14) shows the maximum business risk the corporation can incur on the investment.

Table 1o contains figures on the development of the debt-equity-ratio. Figure 7 presents the equivalent figures for the static debt-ratio and adds information on the development of the dynamic debt-ratios which indicate the number of years it would take to pay back net-debt (debt-capital minus cash on hand) from the annual cash flows.

Creditors have successfully tried to get adequate compensation for the increased financial risk: Not only in higher interest rates but also in the form of better control over business investment policy.[6] Control is exerted via seats on the boards of directors. Despite the Corporation Act of 1965 which limited the number of directorates that an individual can hold, and despite the Co-Determination Act of 1976 that reduced the

number of seats available to share-holders (and thus for
banks owning stock or representing stock) in favor of labor
representatives on the boards, the banks could in fact intensify
their control over industry. This is highlighted by table 11.
Control may be measured by Freeman's Measure of Centrality.
The three major German banks suffered a significant loss in
centrality due to the legislation mentioned. However, the
loss in centrality suffered by all individual top-managers
of the three banks was kept minimal. This was brought about
by increasing the average number of directorship per person
and by placing these persons in   highly central directorates.
This led to an increase in the concentration of seats by persons,
measured by the Gini-Coefficient, while, of course, the con-
centration of seats for the three banks at the whole decreased.

Table 11: Concentration, Information Control and Financial Risk

Average Number of Seats:	1964	1978	Change (in percent)
- All Bankers	1.7886	2.2347	+24.94
- Bankers of			
Deutsche Bank	3.1613	3.6111	+15.32
Commerzbank	2.6875	3.5625	+32.56
Dresdner Bank	3.4444	2.8333	-17.73
Three Banks Total:	3.1231	3.269o	+ 4.67
Concentration of Seats:			
- All Banks	.3334	.357o	+ 7.o8
- Three Banks Total:	.723o	.7o74	- 2.16
Centrality of Information:			
- All Bankers	.76oo	.737o	- 3.o3
- Banks:			
Deutsche Bank	.148o	.o7oo	-52.7o
Commerzbank	.o79o	.o99o	+25.32
Dresdner Bank	.o7oo	.o82o	+17.14
Three Banks Total:	.3o7o	.251o	-18.24

We conclude that the banks have been able to limit the adverse effect of the changes in the relevant laws and that they have retained and in some cases even improved their means of information at control on the board of German manufacturing firms.

The banks have an influence on practically all the branches of industry. Table 12 gives figures that substantiate that statement.

Table 12: Banking Influence on the Board of Directors, by Branches, Percentage of Total Directors Positions

Branch	Distribution of Directorships held by the three major Banks		Percentage of Companies in Branch having at least one Banker on the Board	
	1978	1964	1978	1964
Energy	5	5	4o	
Mining	4	7	18	
Chemical Industry	11	14	55	
Steel Industry	14	23	48	
Metal Industry	12	9	58	
Electrotechnical Industry	14	1o	53	
Construction Industry	17	15	48	
Retailing	23	17	58	
	1oo	1oo		

The figures of table 12 underestimate the influence of the German banks on business investment decisions of manufacturing companies because directorships held by other banks are not included and furthermore directorships held by general managers of banks or any other manager of a bank below executive ranks are not included either.

3.3. Rates of Return and Wage Share

Business risk is the joint effect of uncertainty of sales and
the uncertainty of expenses. There is no doubt but that in-
creases in the cost of raw materials have been a major source
of risk particularly since 1974. However, wage increases have
posed more serious problems particularly in times when wage
demands lossed touch with developments on the international
markets of German manufacturing firms.

We will first look at the result of the bargaining process
on the manufacturing firms' distribution of nominal value
added. For the computational details of value added see the
appendix. Table 13 indicated that the share of value added
that workers receive rose from 7o percent in 1961 to 81 percent
in 1979. The share that the owners of the companies receive
was reduced to a little over a half of the 1961 share. In the
early seventies, labor increased its share significantly. At
the same time creditors almost doubled their share over their
1961 share. In the late sixties high investment and an increasing
leverage led to an improvement of the net capital share at the
cost of business taxes. When in the early seventies growth
rates declined and wage demands lost touch with the international
economic environment which had changed so drastically for Ger-
man corporations, the stock-holders seem to have taken refuge
in transferring residual income (profits) into contractual
income (interest) in order to limit the risk of their total
income stream. The improvement in the share of business taxes
in the late seventies is due to a shift from taxes on earnings
to taxes on property and assets.

The improvement in the real wage share is not quite as signi-
ficant as the improvement in nominal terms. The wage share
rose from 76 percent to 84 percent. During the same period,
the real net capital share decreased from 11.5 percent to
6 percent. Taxes suffered a minor reduction in their share of
real value added only. This is of course due to the fact that

Table 13: Distribution of Value Added, Nominal, in percent

Year	Gross Wage Share	Creditors' Share	Share-Holders' Share	Net-Capital Share	Business Taxes on Profits and Assets	Adjusted Wage Share of National Accounts[1]
1961	7o.34	3.79	8.99	12.78	16.88	62.1
1962	71.71	4.o8	8.74	12.82	15.47	62.8
1963	72.21	4.o7	8.61	12.68	15.11	63.2
1964	72.12	3.94	8.7o	12.64	15.24	62.3
1965	73.12	4.17	9.12	13.29	13.59	62.6
1966	73.53	4.9o	8.87	13.77	12.7o	63.3
1967	74.28	5.o3	8.68	13.71	12.o1	63.2
1968	73.36	4.65	9.13	13.78	12.86	61.3
1969	73.73	4.81	8.56	13.37	12.9o	61.8
197o	75.17	6.16	7.6o	13.76	11.o7	62.7
1971	77.13	5.95	6.76	12.71	1o.16	63.6
1972	77.86	5.23	6.45	11.68	1o.46	63.8
1973	78.32	6.57	5.79	12.36	9.32	64.6
1974	78.81	7.34	5.36	12.7o	8.49	66.3
1975	8o.52	5.91	4.8o	1o.71	8.77	66.1
1976	79.13	5.12	6.19	11.31	9.56	64.9
1977	81.4o	4.76	4.15	8.91	9.69	64.8
1978	81.o9	4.57	4.64	9.21	9.7o	63.8
1979	81.14	4.41	4.84	9.25	9.61	63.1
198o						63.2

1) See f. Board of Economic Experts, Annual Report 198o/81, Stuttgart and Mainz 198o,
   p. 79

inflation increases nominal taxes by a rate that is higher than the increase in the cost of living.

Finally, the improvement of labor's position in the distribution of income is demonstrated by the "Real Wage Position". This indicator was developed by the Board of Economic Experts. The basic idea behind this indicator is that productivity gains and improvements in the terms of trade can be distributed to labor without changing the real cost per unit of output. A rise in the index of the real wage position indicates that the increase in wages exceeds the amount available and vice versa. Table 14 shows the development of the real wage position. It is evident from table 14 and figure 8 that manufacturing suffered more severely from excessive wage demands than the economy as a whole (without government).

Summarizing the analyses so far it seems obvious that two major factors account for the loss in profitability of German manufacturing corporations:

1. In the light of business risk that has increased significantly from the sixties to the seventies risk averse investors (share-holders and banks) have effectively changed the investment behavior of manufacturing firms towards less risky assets.

2. The trade unions have not been willing to shoulder part of the increased business risk. On the contrary, they have increased their share of value added significantly in the seventies thus reducing the margin available to pay risk premia for risk-bearing capital.

Figure 8: Distributions of Value added, real in percent
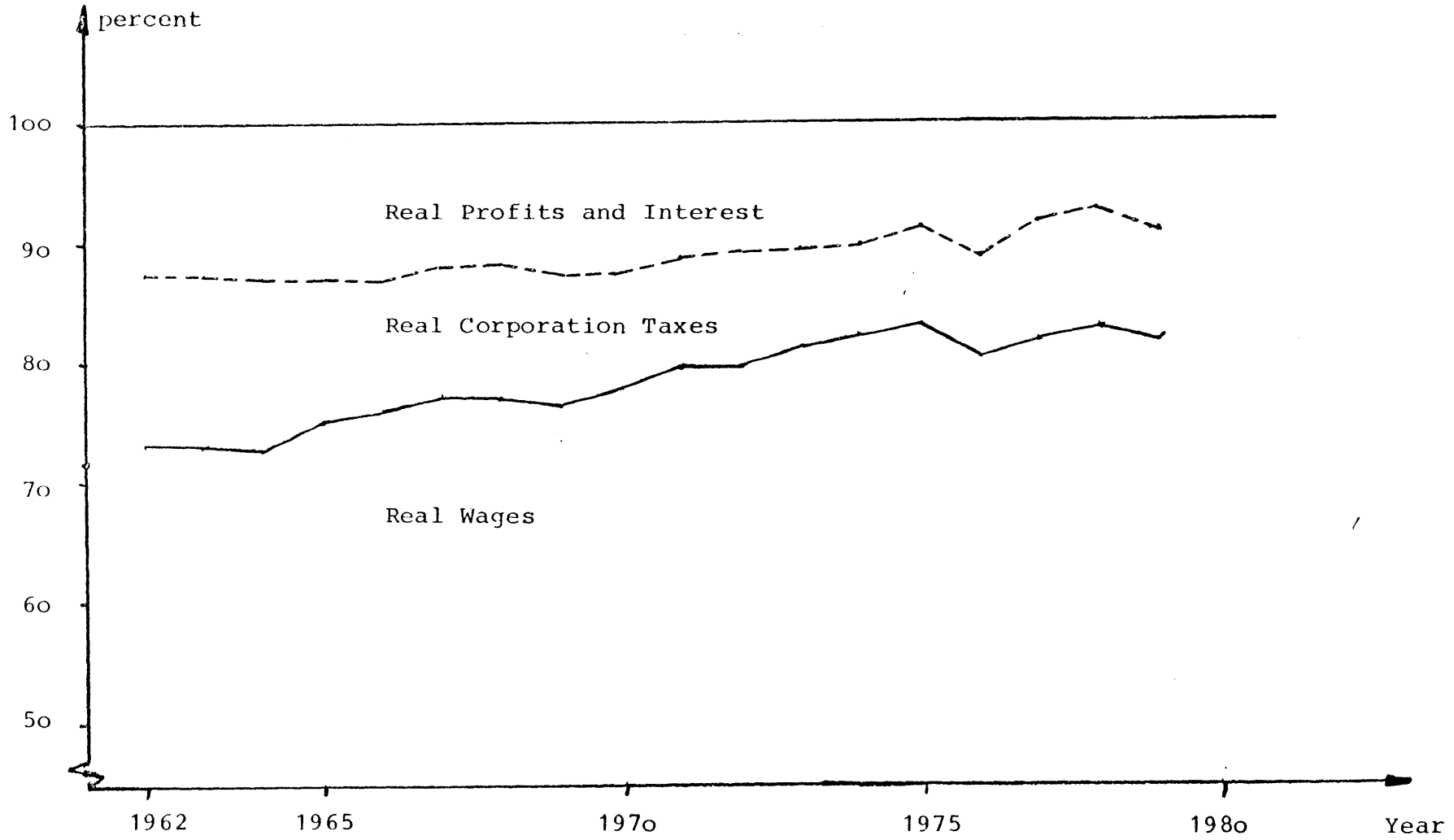
Table 14: Real Wage Position[1], 1962 = 1oo

Year	National Accounts	
	with Capital User Cost in the Margin for Distribution	without Capital User Cost in the Margin for Distribution
1962	1oo.o	1oo.o
1963	1oo.2	99.4
1964	99.o	98.4
1965	99.4	98.6
1966	1oo.2	99.2
1967	98.o	97.9
1968	97.3	95.9
1969	98.1	99.2
197o	1o3.9	1o1.7
1971	1o5.8	1o3.o
1972	1o5.6	1o2.8
1973	1o7.3	1o3.4
1974	11o.5	1o5.1
1975	1o9.o	1o2.8
1976	1o6.6	1o1.2
1977	1o6.5	1o1.1
1978	1o6.3	1oo.5
1979	1o5.2	99.7
198o	1o5.9	99.7

1) Board of Economic Experts, Annual Report 198o/81, loc.cit.
   p. 217

II. The Regression Analyses

We now turn to a statistical analysis of the time series presented in the previous section. First we present results of single equation regressions. Secondly, we explain the development of the rate of return on the basis of an econometric model of the representative German manufacturing firm using multi-equation regressions.

1. Single Equation Models

1.1. The Rate of Return of All Manufacturing Firms

The simple question of a trend in the time series for nominal and real rates of return could be answered in the affirmative. There is a statistically significant trend in the time series of the rates of return on capital invested as well as on equity for the manufacturing sector.

The nominal rates of return show a statistically significant downward trend also in the electrotechnical industry, the chemical industry, and the machinery industry. The real rates of return decrease significantly in the chemical industry, and a statistically significant decrease can also be proved in the time series of the real rate of return on equity of the automobile industry, the electrotechnical industry and the iron and steel industry. I do not present the regression coefficients here because I do not feel that fitting the time series to a linear trend-equation is very illuminating.

Multiple linear regressions may provide a better insight in the determinants of the rate of return. It was decided to use a time factor, real growth of national product, and the inflation rate as explanatory variables. I have first treated the period from 1961 to 1979 as one period and fitted the regression equations to the data of the total period. Then I have assumed that there is a structural break in the period,

so that the years from 1961 to 1968 show an economic behavior which is different from that of the period from 1969 to 1979.

Table 15 shows the results for the development of the rate of return on capital invested, while table 16 gives results for the nominal rate of return on equity. The following conclusions may be drawn from the tables:

- The rate of return on total capital increased between 1961 and 1968 and has decreased ever since.

- The growth rate of gross national product has a positive impact on the profitability of manufacturing companies.

- The inflation rate has a positive influence on the nominal rate of return on capital. The impact seems to be stronger than that of the growth rate.

- The rate of return on equity declined over the total period and certainly over the period from 1969 to 1979. In manufacturing this decline was certainly more marked than that of the rate of return on total capital.

- Growth of gross national product has a significant and rather strong influence on the rate of return on equity.

- The inflation rate has on the whole an influence on the nominal rate of return on equity which is not significant. This is a rather interesting result. Of course share-holders have experienced that they do not gain nominally from inflation. Beliefs that losses in nominal terms do not matter because stock-holders hold real assets were not well-founded, however, as will be shown immediately.

Table 15: Regression Coefficients, Nominal Rate of Return on Total Capital
after Taxes

Firms	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979				
Non-Financial Corporations							
Equation 1	4.3o	----	----	-.o16 (.58)	.o97 (.14)	.116 (.14)	.3393
Equation 2	----	4.223 (8.o1)	4.1o4 (4.38)	-.oo7 (.15)	.1o2 (1.91)	.o22 (.22)	.3423
Equation 3	----	3.757 (13.26)	-----	.111 (4.76)	.o26 (1.12)	.118 (1.58)	.85o3
Equation 4	----	----	4.317 (3.68)	-.o87 (1.39)	.159 (2.22)	.146 (1.31)	.7273
Manufacturing Corporations							
Equation 1	5.68	----	----	-.149 (6.98)	.o5o (1.o7)	.1o7 (1.42)	.7967
Equation 2	----	5.519 (12.64)	5.4o3 (7.o3)	-.126 (3.75)	.o64 (1.41)	.1o3 (1.31)	.8225
Equation 3	----	4.783 (2o.66)	----	.o15 (.78)	.oo3 (.15)	.241 (3.94)	.8oo4
Equation 4	----	----	5.547 (6.96)	-.164 (5.o1)	.1o9 (2.11)	.152 (2.o1)	.8776

t - values are given in brackets

Table 16: Regression Coefficients, Nominal Rate of Return on Equity
after Taxes

Firms	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979				
Non-Financial Corporations							
Equation 1	7.17	-----	-----	-.o65 (1.o4)	.367 (3.58)	-.113 (.6o)	.67o4
Equation 2	----	6.6o9 (5.72)	5.78 (2.82)	-.oo3) (.oo3)	.4o7 (3.47)	-.o41 (.19)	.6849
Equation 3	----	5.867 (7.55)	-----	.134 (2.o9)	.176 (2.74)	.378 (1.85)	.7447
Equation 4	----	-----	4.283 (1.36)	-.o18 (.11)	.6o7 (3.16)	.159 (.53)	.7928
Equation 5	6.86	-----	-----	-.o88 (1.82)	.387 (4.o9)	-----	.6612
Manufacturing Corporations							
Equation 1	1o.88	-----		-.3o9 (5.oo)	.156 (1.15)	.o74 (.34)	.7o78
Equation 2	-----	1o.371 (7.23)	9.827 (3.89)	-.245 (2.22)	.196 (1.32)	.o99 (.39)	.7o15
Equation 3	-----	9.789 (22.18)	-----	-.163 (4.49)	.o95 (2.59)	.345 (2.96),	.9347
Equation 4	-----	------	9.352 (2.o8)	-.249 (1.35)	.274 (.94)	.154 (.36)	.4165
Equation 5	11.12	------	-----	-.3oo (5.6o)	.14o (1.13)	-----	.7o56

t - values are given in brackets

Results of the regression equations run for the real rate of
return are given in tables 17 and 18. The results are not
as convincing statistically as one might hope. However, the
following conclusions may be drawn from tables 17 and 18:

- The decline in real rates of return was a
  common feature for the whole period.

- The decline in the real rate of return
  on equity was more marked than that of
  the real rate of return on capital.

- The decline in the real rate of return on
  equity was greater than that in the nominal
  rate.

- The decline was greater in the period from
  1969 to 1979 than in the period from 1961 to 1968.

- The structural break between the sixties and
  the seventies is rather significant. It amounts
  to .5 percent in the rate of return on total
  capital and to over 1 percent in the rate of
  return on equity.

- The rate of growth in real GNP has, wherever
  significant, a positive effect on the rate
  of return.

- The inflation rate has a negative impact on
  the real rate of return regardless of which
  measure of the real rate of return is taken
  and regardless also of which explanatory equation
  is used.

Table 17: Regression Coefficients, Real Rate of Return on Total Capital after Taxes

Firms	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979				
Non-Financial Corporations							
Equation 1	3.49	-----	-----	-.o45 (1.64)	.o72 (1.6o)	-.115 (1.37)	.6346
Equation 2	----	3.226 (6.32)	2.83o (3.12)	-.o15 (.33)	.o92 (1.77)	-.o81 (.85)	.6535
Equation 3	----	2.95o (6.66)	-----	.o91 (2.51)	.o11 (.31)	-.o3o (.26)	.6631
Equation 4	----	-----	2.851 (2.84)	-.o87 (1.65)	.159 (2.59)	.o57 (.59)	.8223
Equation 5	3.18	-----	-----	-.o69 (3.o4)	.927 (2.o9)	-----	.5815
Equation 6	3.95	-----	-----	-.o47 (1.6o)	-----	-.159 (1.9o)	.5628
Manufacturing Corporations							
Equation 1	7.22	-----	-----	-.o5o (2.15)	-.oo9 (.18)	-.5o8 (6.14)	.845o
Equation 2	----	6.o51 (6.22)	5.523 (3.23)	-.135 (1.81)	-.o19 (.18)	-.573 (3.29)	.8396
Equation 3	----	5.284 (6.o1)	-----	.1oo (1.38)	-.o7o (.96)	-.6o3 (2.6o)	.7859
Equation 4	----	-----	6.o57 (2.59)	-.216 (2.25)	.o29 (.19)	-.482 (2.16)	.696 4
Equation 5	5.52	-----	-----	-.115 (3.o6)	.1o1 (1.16)	-----	.4556
Equation 6	7.16	-----	-----	-.o5o (2.22)	-----	-.5o3 (6.69)	.8446

t-values are given in brackets

Table 18: Regression Coefficients, Real Rate of Return on Equity after Taxes

Firms	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979				
Non-Financial Corporations							
Equation 1	5.43	-----	-----	-.176 (3.44)	.226 (2.7o)	-.339 (2.19)	.8516
Equation 2	-----	4.663 (5.15)	3.37o (2.12)	-.o83 (1.o1)	.286 (3.15)	-.231 (1.39)	.8735
Equation 3	-----	4.128 (4.29)	-----	.o54 (.68)	.1oo (1.26)	.o13 (.o5)	.3134
Equation 4	-----	-----	2.383 (1.25)	-.131 (1.3o)	.45o (3.87)	-.o23 (.13)	.9o57
Equation 5	4.52	-----	-----	-.245 (5.36)	.286 (3.19)	-----	.7969
Equation 6	6.82	-----t	-----	-.181 (2.93)	-----	-.474 (2.69)	.7685
Manufacturing Coporations							
Equation 1	11.48	-----	-----	-.326 (6.83)	-.oo8 (.o8)	-.296 (1.75)	.8492
Equation 2	------	8.112 (5.41)	6.962 (2.64)	-.289 (2.51)	.119 (.77)	-.285 (1.o6)	.8281
Equation 3	------	7.483 (4.57)	-----	-.o18 (.14)	.135 (.99)	-.538 (1.25)	.4oo4
Equation 4	------	-----	8.181 (2.o7)	-.4o3 (2.48)	.118 (.46)	-.2o3 (.54)	.6o36
Equation 5	1o.49	-----	-----	-.364 (8.o6)	.o56 (.54)	-----	.8185
Equation 6	11.43	-----	-----	-.326 (7.o6)	-----	-.292 (1.9o)	.8492

t-values are given in brackets

1.2. The Rate of Return in the Chemical Industry

As stated earlier, the development of the rate of return in
the different branches of industry does not parallel that of
all manufacturing companies in Germany taken together. We pre-
sent the results for the chemical industry in this section and
refer the reader to the appendix for the results of the re-
gressions on the data of other branches of industry.

Table 19 and 2o give results for the nominal rates of return
on total capital and equity after taxes respectively. I venture
to draw the following conclusions:

- The rates of return on total capital and
  on equity declined significantly during the
  period 1961 to 1979.

- The structural break in the time series is pro-
  nounced. The levels of the rates of return
  differ significantly between the sixties and
  the seventies. The difference is particularly
  pronounced in the case of the rate of return
  on equity.

- In the sixties, the rates of return showed a
  positive or at least not negative trend.
  The negative trend in the seventies is signi-
  ficant.

- The growth rate of real GNP had a significant
  effect on the rate of return. The effect on the
  rate of return on equity was more pronounced
  than that on the rate of return on total capital.

- Inflation rates did not have a significant effect
  on the nominal rates of return.

Table 19: Regression Coefficients, Nominal Rate of Return on Total Capital after Taxes
- Chemical Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979				
Equation 1	7.24	-----	-----	-.177	.o43	-.o54	.7637
				(5.54)	(.61)	(.47)	
Equation 2	----	6.429	5.241	-.o9o	.1o2	.o57	.7926
		(9.oo)	(4.17)	(1.63)	(1.34)	(.45)	
Equation 3	----	5.357	-----	.113	.o65	.179	.6813
		(1o.52)		(2.69)	(1.54)	(1.33)	
Equation 4	----	-----	5.931	-.159	.124	.o97	.6169
			(3.53)	(2.29)	(1.14)	(.6o)	
Equation 5	7.o6	-----	-----	-.184	.o55	-----	.76o2
				(6.62)	(.85)		
Equation 6	7.51	-----	-----	-.178	-----	-.o78	.7578
				(5.69)		(.75)	

t-values are given in brackets

Table 2o: Regression Coefficients, Nominal Rate of Return on Equity   after Taxes
- Chemical Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979				
Equation 1	12.o7	-----	-----	-.3o6	.242	-.2o1	.6906
				(3.96)	(1.42)	(.73)	
Equation 2	-----	9.o34	4.458	.o13	.458	.245	.8288
		(6.55)	(1.84)	(.13)	(3.22)	(.99)	
Equation 3	-----	6.416	-----	.325	.37o	.857	.9284
		(7.89)		(4.85)	(5.48)	(3.99)	
Equation 4	-----	-----	5.6o4	-.o76	.489	.243	.513o
			(1.51)	(.5o)	(2.o3)	(.69)	
Equation 5	11.4o	-----	-----	-.332	.285	-----	.6796
				(4.89)	(1.82)		
Equation 6	13.57	-----	-----	-.312	-----	-.388	.6489
				(3.91)		(1.27)	

t-values are given in brackets

In order to exploit the data bank fully, we have run single
equation estimations for the real rates of return not only
with the aggregate data of the 21 firms in the chemical industry,
but also with the pooled data, using the ordinary least squares
method with dummy variables for the individual firms. The con-
stant shown in tables 21 and 22 is the mean value of the 21
firm constants. The results achieved with the pooled regression
method are, however, not more convincing than the results with
the ordinary least squares method for the aggregate data.

From table 21 and 22 we can corroberate what has been said earlier
about the chemical industry:

- The decline in the real rate of profit
  is significant.

- During the sixties, the chemical industry
  in fact improved its profitability somewhat
  total capital and significantly (using the
  leverage effect to the fullest extent) on
  equity capital.

- During the seventies the chemical industry
  suffered significant annual losses in profi-
  tability.

- The structural break in the time series
  between the sixties and the seventies
  is marked, in fact more marked than in
  the case of the nominal data.

- Inflation has a very negative impact on
  real profitability. In practically
  every equation run the impact of inflation
  on the rate of return on equity exceeds that
  on the rate of return on total capital. This
  is evidence again that creditors could shelter
  their amounts against inflation better than the
  stock-holders of the companies in the chemical
  industry.

Table 21:   Regression Coefficients, Real Rate of Return on Total Capital after Taxes
- Chemical Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1968-1979				
Equation 1							
OLS	8.34	----	----	-.125	.07o	-.519	.6714
				(2.31)	(.59)	(2.7o)	
OLSDV	7.84	----	----	-.177	.o33	-.887	.2939
				(3.6o)	(.31)	(5.o8)	
Equation 2	----	6.2o7	2.94o	.o11	.243	-.733	.841o
		(3.97)	(1.o7)	(.o9)	(1.5o)	(2.61)	
Equation 3	----	4.455	----	.413	.282	-.819	.7823
		(2.21)		(2.48)	(1.69)	(1.54)	
Equation 4	----	----	5.23o	-.156	.2o1	-.689	.6926
			(1.5o)	(1.o31)	(.89)	(1.5o)	
Equation 5							
OLS	6.61	----	----	-.191	.183	-----	.5113
				(3.37)	(1.39)		
OLSDV	4.89	----	----	-.29o	.225	-----	.2453
				(6.43)	(2.16)		
Equation 6							
OLS	8.78	----	----	-.126	----	-.558	.6638
				(2.39)		(3.17)	
OLSDV	8.o5	----	----	-.177	----	-.9o5	.2937
				(3.62)		(5.55)	

OLS - Ordinary least squares estimation
OLSDV - Ordinary least squares estimation method with dummy variables for the individual firm
t-values are given in brackets

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Table 22: Regression Coefficients, Real Rates of Return on Equity after Taxes
- Chemical Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979				
Equation 1							
OLS	12.68	----	----	-.293	.2o5	-.713	.6547
				(2.79)	(.89)	(1.91)	
OLSDV	14.19	----	----	-.493	-.o52	-1.36	.119o
				(2.64)	(.13)	(2.o4)	
Equation 2	----	6.878	-.921	.164	.632	-.513	.8561
		(3.o1)	(.23)	(.93)	(2.68)	(1.25)	
Equation 3	----	4.754	----	.833	.817	-1.154	.7819
		(1.16)		(2.48)	(2.41)	(1.o7)	
Equation 4	----	----	3.7o3	-.151	.485	-.444	.8689
			(1.52)	(1.51)	(3.o6)	(1.91)	
Equation 5							
OLS	1o.3o	----	----	-.384	.359	-----	.57o4
				(3.81)	(1.54)		
OLSDV	9.67	----	----	-.667	.242	-----	.1o92
				(3.98)	(.63)		
Equation 6							
OLS	13.95	----	----	-.298	-----	-.829	.6366
				(2.86)		(2.39)	
OLSDV	13.87	----	----	-.492	-----	-1.326	.1189
				(2.64)		(2.13)	

OLS - Ordinary least squares estimation
OLSDV - Ordinary least squares method with dummy variables for the individual firm
t-values are given in brackets

- Growth of real GNP has a very significant effect
  on profitability.

The single equation models clearly show that the combination
of

- rising inflation rates
- decreasing growth rates in the economy

may be considered as the two major determinants of the
declining rates of return in German manufacturing.

The oil-shock and the shock of floating exchange rates have
hit German manufacturing companies very hard. They are operating
now under a different economic climate. They are now working under
fundamentally altered chances of making a reasonable profit.
The chemical industry, the major of German gross industry of
the sixties, was particularly affected by these shocks and
it has not yet recovered from them as far as profits are con-
cerned.

2. A Multi-Equation Model of German Manufacturing Companies

2.1. The Model

The rate of return on capital that a company earns is the final
result of the interaction of management decisions with the en-
vironment of the company. Management decisions relate to many
functional areas of the company's activities and to many pro-
duct divisions and markets on which the company sells its pro-
ducts. Therefore, it seems a gross simplification of the highly
complex reality if one tries to explain the development of the
rate of return by the impact of three determinant factors: time,
real growth rate, and inflation rate.

We will therefore try to explain the development of the rates of return of German manufacturing industry by the use of a more complex model. The model is a multi-equation econometric model of the firm based on the assumption of optimizing behavior of the managers and charge of the different functional areas of the company. The equations are estimated from the financial data of the firms in the Bonn Data Bank.

The equations of the model were fitted to the data for the period from 1969 to 1976 in order to allow for ex ante-forecasts of the behavior of the model which could be confronted with actual behavior in the years from 1977 to 1979. The model has 24 equations. 15 equations describe the behavior of the firm.

The equations are given below

(15) <u>Cash Flow</u>

$$CF = (pU - wL - mM - r_T FK_{-1} - 0.15(h\ VF + m\ VM) - MA - SAW)\ (1-s)$$
$$+ s\ d\ SAV_{-1}$$

(16) <u>Sales</u>

$$U = a_o N (\frac{MA}{MAB})^{0.156} (\frac{I}{IB})^{0.062} (\frac{U_{-1}}{UB_{-1}})^{0.63}$$

(17) <u>Finished Goods</u>

$$VF = 0.217\ U^{0.579} \left[\frac{w}{h(r+.15-\dot{h}/h)} \right]^{0.294} A^{-0.300} VF_{-1}^{0.374}$$

(18) <u>Output</u>

$$X = U + VF - VF_{-1}$$

(19) Investment in Fixed Assets

$$I = 0.036 + 0.352 \cdot \sum_{i=0}^{1} (\frac{(CF+MA)}{q \cdot K})_{-i}$$

$$+ \sum_{i=0}^{3} (\frac{UB_{-i} - UB_{-i-1}}{UB_{-i-1}}) + 0.582 \cdot \sum_{i=0}^{3} (\frac{k_{-i} - k_{-i-1}}{k_{-i-1}})$$

$$+ 0.220 \cdot (\frac{I_{-1}}{K_{-2}}) K_{-1}$$

(20) User-Cost of Capital

$$c = q \left[(\frac{FK}{GK}) r + (\frac{EK}{GK}) \cdot (\frac{\rho}{1-s}) - \frac{\dot{q}}{q} + 0.12 \right]$$

(21) Relative Input-Prices for the Investment Function

$$k = \frac{w^{0.587} m^{0.413}}{c}$$

(22) Depreciation Rate

$$\delta = 0.06 + 0.06 \, A^4$$

(23) Fixed Assets

$$K = K_{-1} (1-\delta) + I_{-1}$$

(24) Desired Labor Input

$$L^* = 1.28 \, X \, (\frac{\delta' q}{w})^{0.254} (\frac{m}{w})^{0.308} e^{-0.017t}$$

(25) <u>Desired Raw Material Input</u>

$$M^* = 0.90 \ X \ \left(\frac{\delta' q}{m} \right)^{0.254} \left(\frac{w}{m} \right)^{0.438} e^{-0.017t}$$

(26) <u>Desired Capacity Utilization</u>

$$A^* = 1.03 \ (X/K)^{0.309} \left(\frac{w}{q} \right)^{0.135} \left(\frac{m}{q} \right)^{0.095} e^{-0.0053t}$$

(27) <u>Actual Labor Input</u>

$$L = (L^*)^{0.554} (M^*)^{0.097} (L_{-1})^{0.446} (M_{-1})^{-0.097}$$

(28) <u>Actual Raw Material Input</u>

$$M = (L^*)^{0.098} (M^*)^{0.927} (L_{-1})^{-0.098} (M_{-1})^{0.073}$$

(29) <u>Capacity Utilization</u>

$$A = A^* (L^*/ L_{-1})^{0.360}$$

(30) <u>Inventories</u>

$$VM = 0.218 \ M^{0.483} \left[\frac{w}{m(r+.15-\dot{m}/m)} \right]^{0.331} A^{-0.222} \ VM_{-1}^{0.443}$$

(31) <u>Production Cost per Unit of Output</u>

$$h = \frac{wL + mM + d \ SAV_{-1}}{L + M + d \ SAV_{-1}/q}$$

(32) **Plant and Equipment**

$$SAV = SAV_{-1} (1-d) + q \cdot I$$

(33) **Total Capital Invested**

$$GK = SAV + h\ VF + m\ VM + 0.45\ p \cdot U$$

(34) **Equity**

$$EK = 10.697\ (\frac{CF}{GK})\ (\ 9.245 + 0.068\ GK - 81.7\ \rho + 37.6 \cdot r$$

$$- 0.212\ EK_{-1} - 0.012\ FK_{-1}\ )\ + EK_{-1}$$

(35) **Debt Capital**

$$FK = GK - EK$$

(36) **Interest Rate**

$$r = 2.237\ r_M\ (\frac{FK}{GK})^2$$

(37) **Industry Sales**

$$UB = \Sigma U$$

(38) **Total Business Investment Outlay in Industry**

$$IB = \Sigma I$$

The Endogenous Variables are:

A	:=	Capacity Utilization
A^*	:=	Desired Capacity Utilization
c	:=	User Cost of Capital
CF	:=	Cash Flow after Taxes
δ	:=	Depreciation Rate
EK	:=	Equity
FK	:=	Debt Capital
GK	:=	Total Capital
h	:=	Production Cost per Unit of Output
I	:=	Investment in Fixed Assets
IB	:=	Total Investment of Industry
K	:=	Total Capital Invested
k	:=	Relative Input-Prices for the Investment Function
L	:=	Labor Input
L^*	:=	Desired Labor Input
M	:=	Raw Material Input
M^*	:=	Desired Raw Material Input
r	:=	Interest Rate dependent on Debt-Equity-Ratio
SAV	:=	Plant and Equipment
U	:=	Sales
UB	:=	Total Sales in Industry
VF	:=	Stock of Finished Goods
VM	:=	Inventories
X	:=	Output

The Exogenous Variables are:

d	:=	Depreciation Rate for Taxation Purposes
m	:=	Raw Materials Price
MA	:=	Marketing Expenditures of the Firm
MAB	:=	Marketing Expenses in Industry
N	:=	Total Demand
p	:=	Product Price
q	:=	Price Index of Investment Goods
r_M	:=	Market Rate of Interest
r_T	:=	Actual Interest Rate payed by the Firm
ρ	:=	Cost of Equity
s	:=	Corporation Income Tax Rate
SAN	:=	Other Expenditures
t	:=	Period
w	:=	Wage Rate

2.2. The Results

2.2.1. The Development of the Rate of Return 197o to 1979

Table 23 and figures 9 to 11 show actual and model rates of
return for the period from 197o to 1979. The model underesti-
mates total rates of return before tax but seems to have a ex-
planatory power for the development of the rate of return after
tax, and it describes the development of the rate of return
on equity rather well taking into account the wide fluctuations
in the rate of return on equity that German manufacturing
firms experienced in the period from 197o to 1979.

2.2.2. Sensitivity Analyses of the Rate of Return

If we accept the multi-equation model as a description of
rational behavior of the German manufacturing firms in a
complex economic environment, then clearly we can study the
impact of certain exogenous variable on the rate of return.

The influences that may be considered important are

- the rate of growth of total demand
- the rate of increase in wages and salaries
- the rate of raw materials price increases
- the rate of technological progress
- the corporation income tax rate

Table 23: Nominal Rate of Return

on Total Capital before Taxes

Year	Actual	Model
197o	9.24	8.392
1971	7.72	7.772
1972	8.76	7.843
1973	9.67	7.44o
1974	7.o1	4.549
1975	8.21	5.869
1976	1o.39	7.649
1977	9.59	6.711
1978	9.2o	6.744
1979	9.43	6.688

on Total Capital after Taxes

Year	Actual	Model
197o	6.11	5.9o4
1971	5.o4	5.6o8
1972	5.o6	5.539
1973	5.63	5.393
1974	3.81	3.749
1975	4.43	4.49o
1976	5.91	5.35o
1977	4.5o	4.741
1978	4.27	4.76o
1979	4.44	4.676

on Equity after Taxes

Year	Actual	Model
197o	1o.81	9.33o
1971	7.23	8.328
1972	7.71	8.878
1973	8.48	8.o66
1974	4.38	3.481
1975	5.11	6.258
1976	12.37	9.763
1977	8.15	8.317
1978	6.71	8.523
1979	8.63	9.o4o

Figure 9: Nominal Rate of Return on Total Capital
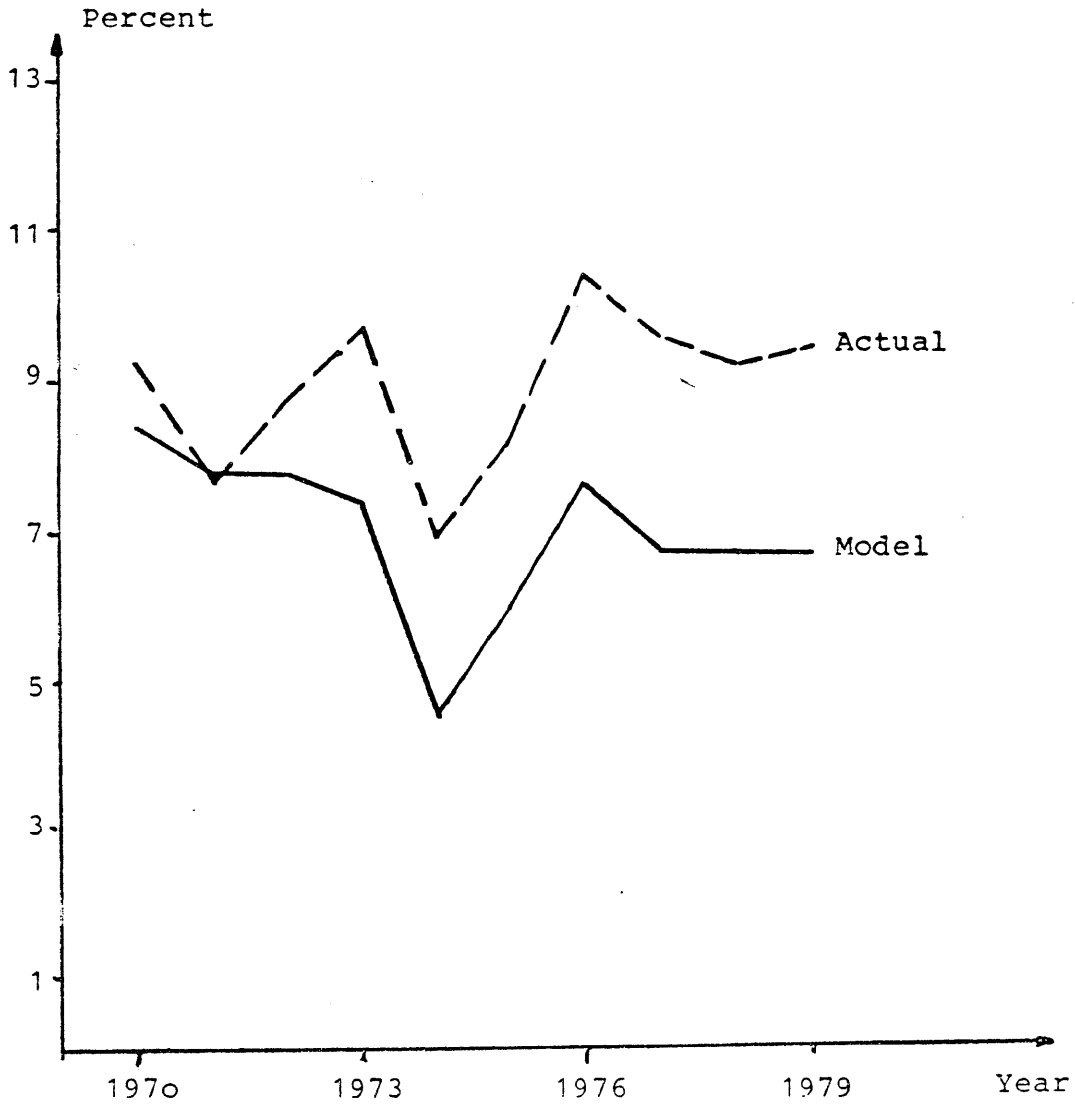before Taxes

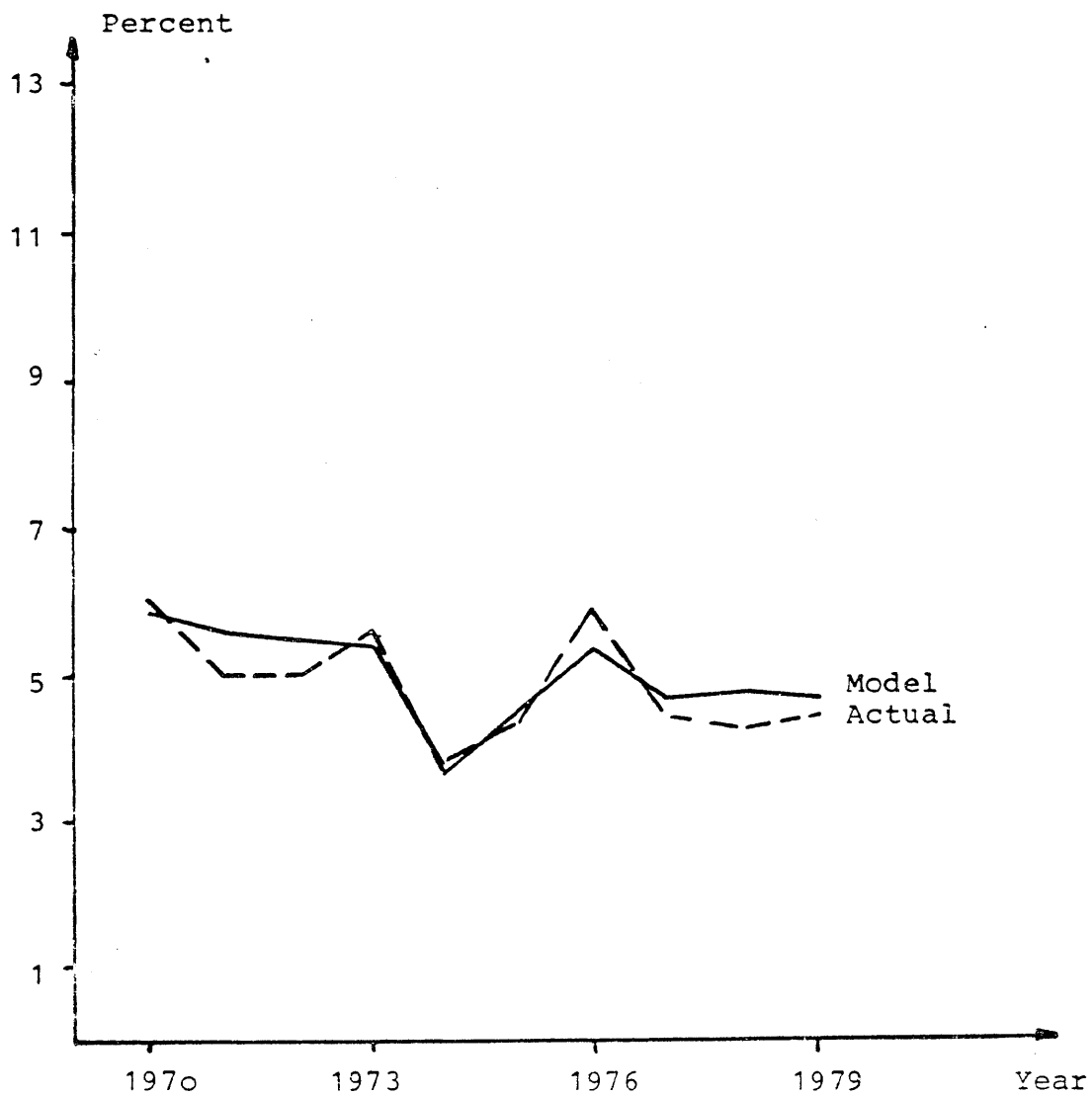Figure 1o: Nominal Rate of Return on Total Capital
after Taxes

Table 24: Sensitivity Analysis

        Growth Rate of Demand

Year	Constant Growth Rate of Demand	Model Estimates of Rates of Return		
		Total Capital before Taxes	Total Capital after Taxes	Equity
1970	1.9	8.392	5.904	9.330
1971	1.9	7.600	5.502	8.035
1972	1.9	7.607	5.391	8.440
1973	1.9	7.252	5.270	7.673
1974	1.9	4.948	3.984	4.161
1975	1.9	6.781	4.987	7.739
1976	1.9	7.557	5.303	9.752
1977	1.9	6.399	4.560	7.881
1978	1.9	6.371	4.538	7.908
1979	1.9	6.228	4.397	8.135

Year	Actual Growth Rate of Demand	Model Estimates of Rates of Return		
		Total Capital before Taxes	Total Capital after Taxes	Equity
1970	——	8.392	5.904	9.330
1971	2.86	7.772	5.608	8.328
1972	3.19	7.843	5.539	8.878
1973	3.01	7.440	5.393	8.066
1974	− 0.30	4.549	3.749	3.481
1975	− 2.57	5.969	4.490	6.258
1976	2.64	7.649	5.350	9.763
1977	2.80	6.711	4.741	8.317
1978	3.50	6.744	4.760	8.523
1979	4.50	6.688	4.676	9.040

Figure 12:   Sensitivity Analysis: Growth of Demand
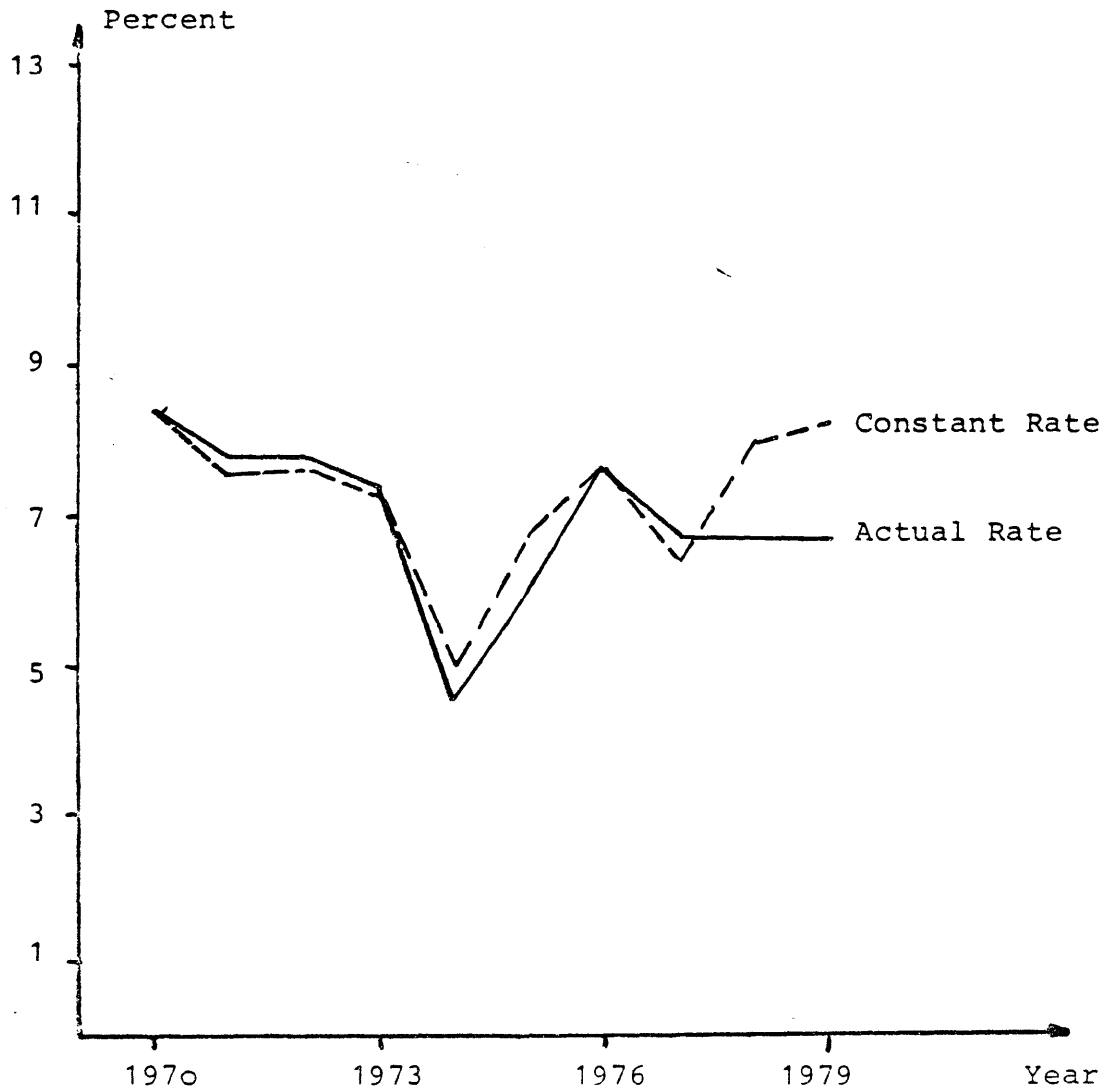Rate of Return on Total Capital
before Taxes

Figure 13: Sensitivity Analysis: Growth of Demand
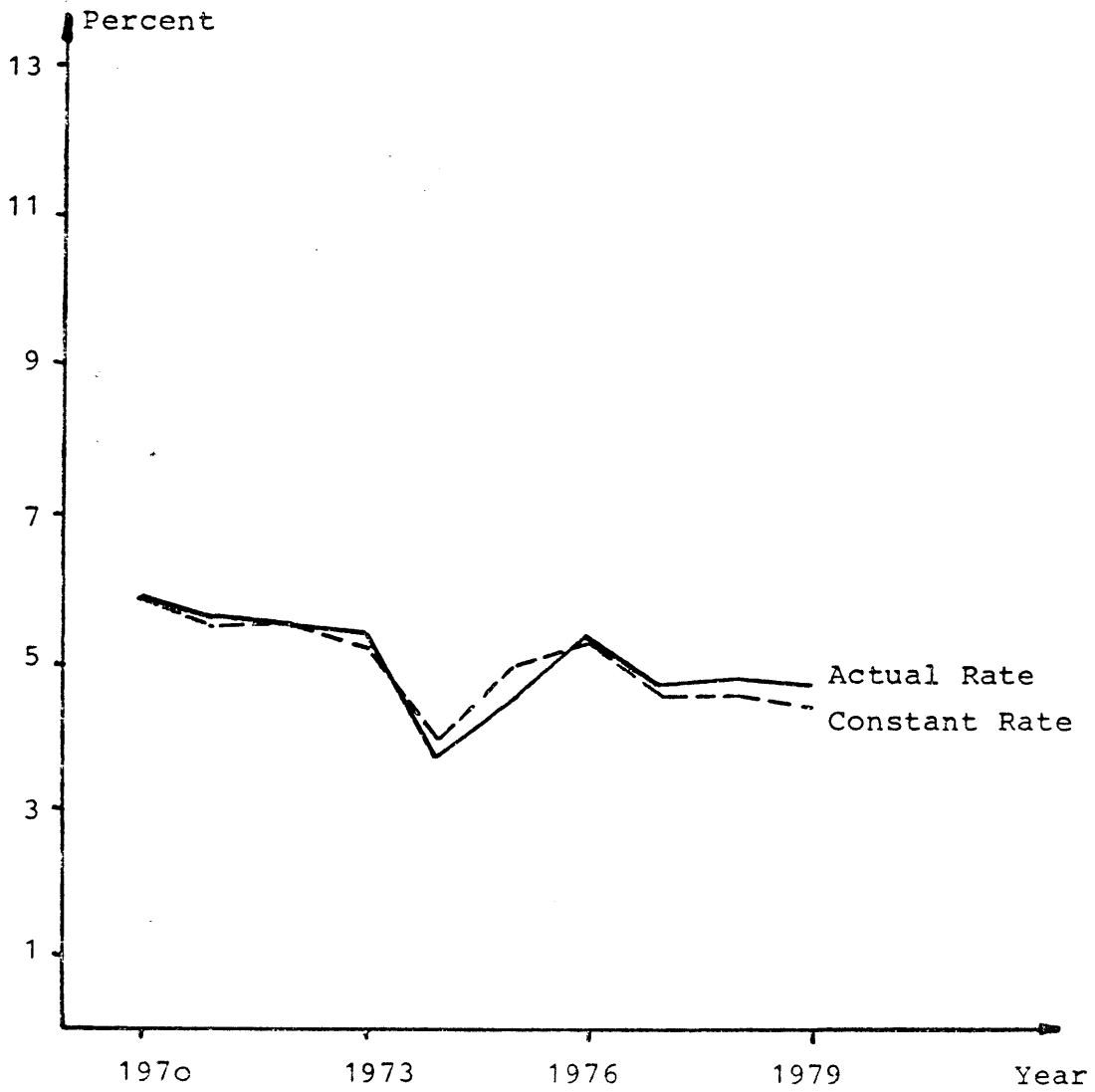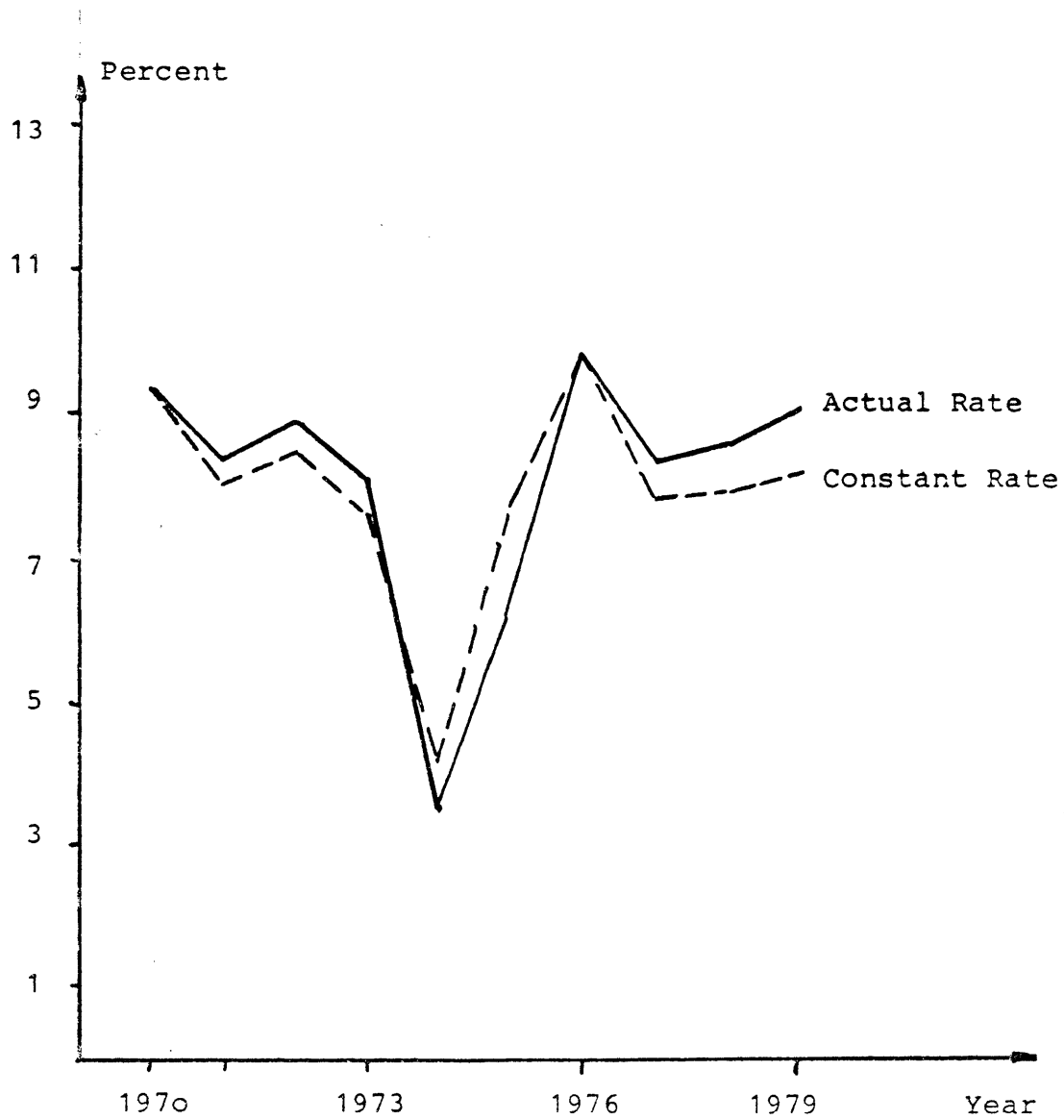Rate of Return on Total Capital
after Taxes

Figure 14: Sensitivity Analysis: Growth of Demand
Rate of Return on Equity after Taxes

The impact of the rate of growth of demand on profitability does not seem to be very significant. In fact, the average growth rate during the period is 1o percent below the actual growth rate, but the average rate of return on capital after taxes is only 1 percent below the rate of return on the basis of the actual growth of demand. Table 24 and figures 12 to 14 show the results of the sensitivity analyses. It is plausible that rates of return on the basis of a constant rate of growth of demand should be higher in periods when actual growth rates were lower and vice versa.

We now look at the influence that wage increases have on the rate of return in our representative manufacturing firm. Table 25 and figures 15 to 17 demonstrate the devastating effects that the exorbitant wage demands of the early seventies had on the rates of return of German manufacturing companies. In fact, the constant growth rate is higher by roughly 3 percent than the average rate of increase of wages and salaries during the period. The influence on the total rate of return is less important than that on the rate of return on equity. Of course the oil-price-hike of 1973/74 could have been absorbed even if the wage increases had been constant over the period. But the combination of excessive wage demands and increases in the price of oil had a remarkable effect on the rate of return on equity after taxes: it dropped from over 9 percent to 3.5 percent within 4 years. Since during 1978 and 1979 wage increases were well below the assumed constant rate of growth, the sensitivity analysis shows that the rate of return on the basis of the actual data is above the rate of return in the constant rate of increase case.

Table 25:   Sensitivity Analysis, Increase in Wages and Salaries

Year	Constant Annual Increase in Wages	Model Estimates of Rates of Return		
		Total Capital before Taxes	Total Capital after Taxes	Equity after Taxes
1970	8.33	8.392	5.904	9.330
1971	8.33	9.154	6.434	10.420
1972	8.33	9.351	6.438	11.116
1973	8.33	9.925	6.873	11.810
1974	8.33	7.709	5.628	8.775
1975	8.33	8.556	6.027	10.383
1976	8.33	8.997	6.149	11.809
1977	8.33	7.445	5.175	9.429
1978	8.33	6.011	4.317	7.222
1979	8.33	4.976	3.649	5.965

| Year	Actual Increases in Wages	Model Estimates of Rates of Return		
		Total Capital before Taxes	Total Capital after Taxes	Equity after Taxes
1970	———	8.392	5.904	9.330
1971	11.30	7.772	5.608	8.328
1972	8.92	7.843	5.539	8.878
1973	10.42	7.440	5.393	8.066
1974	10.19	4.549	3.749	3.481
1975	7.89	5.969	4.490	6.258
1976	6.36	7.649	5.350	9.763
1977	.7.11	6.711	4.741	8.317
1978	5.31	6.744	4.760	8.523
1979	5.78	6.688	4.676	9.040

The influence of the price for raw materials is very important
indeed. In the model simulation we have assumed that the average
growth rate of the price index was about the same in the two
simulations. However, the price was kept at a constant 6.1
percent over the period in one simulation run, while the actual price
increases were used as exogenous variables in the other simulations
Table 26 and figures 18 to 2o show the results. In interpreting
these results we have to keep in mind that the model does not
assume that cost-plus-pricing is possible. It is on the other
hand certainly not very realistic to assume that pricing
behavior is unaffected by the short-term development of raw
materials prices. The model assumes prices as given, however,
and allows for adjustments only in the labor input, in invest-
ment activity,and in the desired raw materials input. The most
interesting result is that the fluctuations in the rate of re-
turn on equity would have been even greater than in the case
of the actual price increases if raw material prices had increased
at a constant rate over the period. Obviously these fluctuations
are due to the actual pricing policy which we have assumed con-
stant. Since prices do follow the development of the cost of raw
materials to some extent, the simulation with a constant
rate of increase in the raw materials price overestimates the
fluctuations in the rate of return on equity.

Table 26: Sensitivity Analysis: Price Increase for Raw Materials

Year	Constant Rate of Price Increase for Raw Materials	Model Estimates of Rates of Return		
		Total Capital before Taxes	Total Capital after Taxes	Equity after Taxes
1970	6.1	8.392	5.9o4	9.33o
1971	6.1	6.232	4.687	5.977
1972	6.1	4.572	3.586	3.869
1973	6.1	4.42o	3.594	3.331
1974	6.1	9.4o2	6.644	11.636
1975	6.1	9.656	6.691	12.261
1976	6.1	1o.629	7.128	14.515
1977	6.1	7.821	5.4o1	1o.o63
1978	6.1	6.o53	4.343	7.3o1
1979	6.1	5.83o	4.161	7.477

Year	Actual Price for Raw Materials	Model Estimates of Rates of Return		
		Total Capital before Taxes	Total Capital after Taxes	Equity after Taxes
1970	——	8.392	5.9o4	9.33o
1971	2.oo	7.772	5.6o8	8.328
1972	1.96	7.843	5.539	8.878
1973	7.79	7.44o	5.393	8.o66
1974	3o.24	4.549	3.749	3.481
1975	1.37	5.969	4.49o	6.258
1976	4.o5	7.649	5.35o	9.763
1977	1.65	6.711	4.741	8.317
1978	1.9o	6.744	4.76o	8.523
1979	6.23	6.688	4.675	9.o4o

Figure 18: Sensitivity Analysis: Price Increase for
Raw Materials
Rate of Return on Total Capital before Taxes
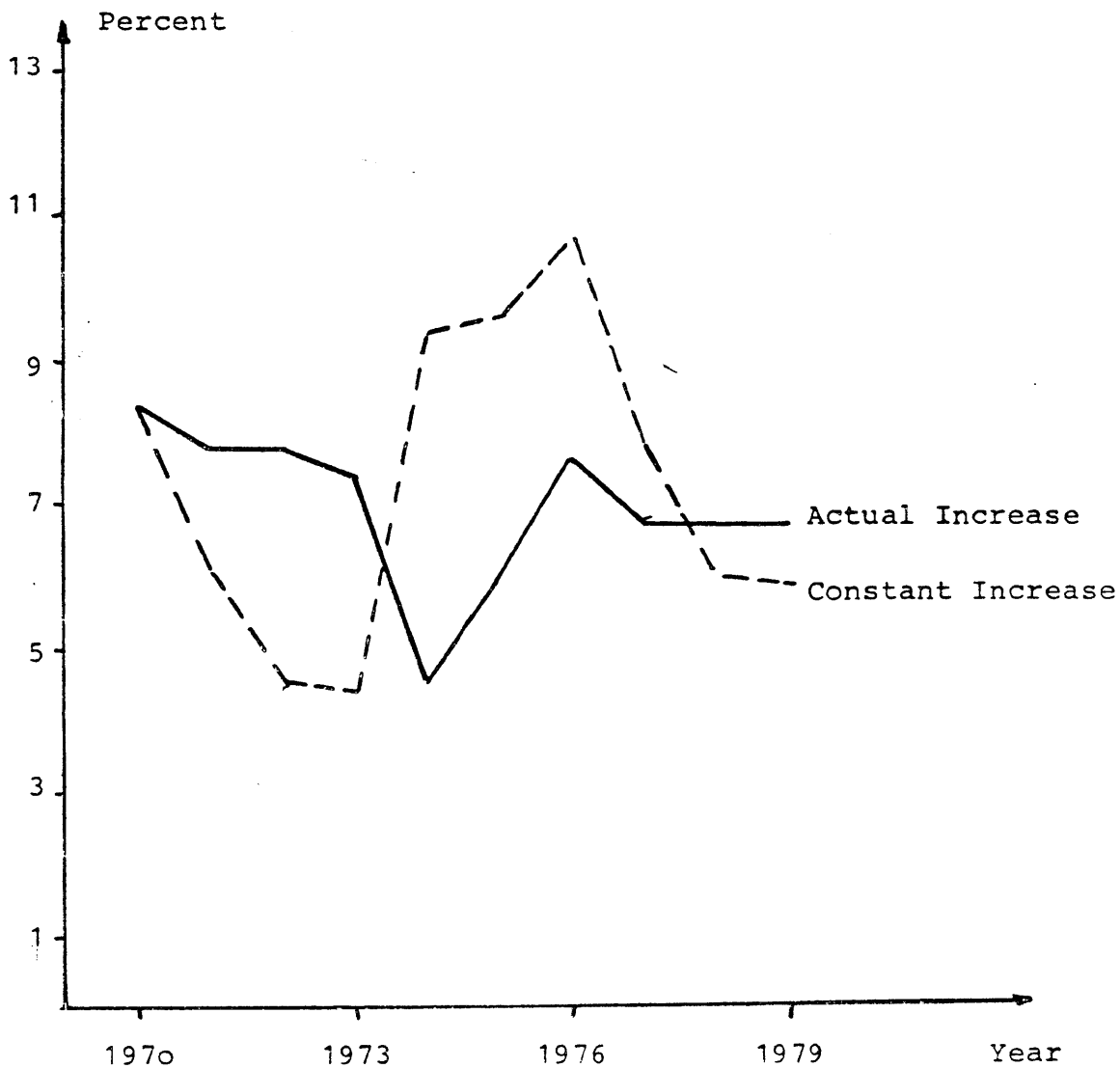
Over the past twenty years manufacturing industry has realized
a rate of technological progress of 1.7 percent. In order to
analyze the importance of the rate of technological progress
in the production function we assume that the rate of techno-
logical progress was 1.45 percent and 1.95 percent respectively.
Table 27 and figures 21 to 23 show the results of the simul-
ation runs. They are as expected. Other factors remaining equal
technological progress results in higher profitability of
capital and particularly of equity. Technological progress
of 1.95 percent could have brought back the rate of return
of total capital to the 197o rate by 1979 if prices and wages
had remained unaffected. The rate of return on equity could
have been increased to 12 percent. However, the actual rate
of technological progress of 1.7 percent was not adequate to
stem the decrease in the total rate of return and was just suffi-
cient to bring the rate of return on equity back to 197o
levels. We have shown in an earlier paper that over the past
twenty years productivity gains have in the medium-term re-
sulted in higher wages. In fact, capital gained only shortly
and only to the extent that a firm gained a technological ad-
vantage over its competitors. Once the majority of the firms
had improved production the wage earners effectively intern-
alized the technological progress in their wage increases[7] .
The model used in the simulation runs uses the wage rate as
an exogenous variable so that technological progress benifits
the stock-holders only.

We conclude that technological progress is a very significant
factor as far as the rate of return on equity is concerned,
particularly in the short-run. Technological progress was,
however, not adequate to offset the negative influences of
increased international competition as well as of immoderate
wage demands   on   the return on capital in German manufacturing
companies.

Figure 21: Sensitivity Analysis: Technological Progress
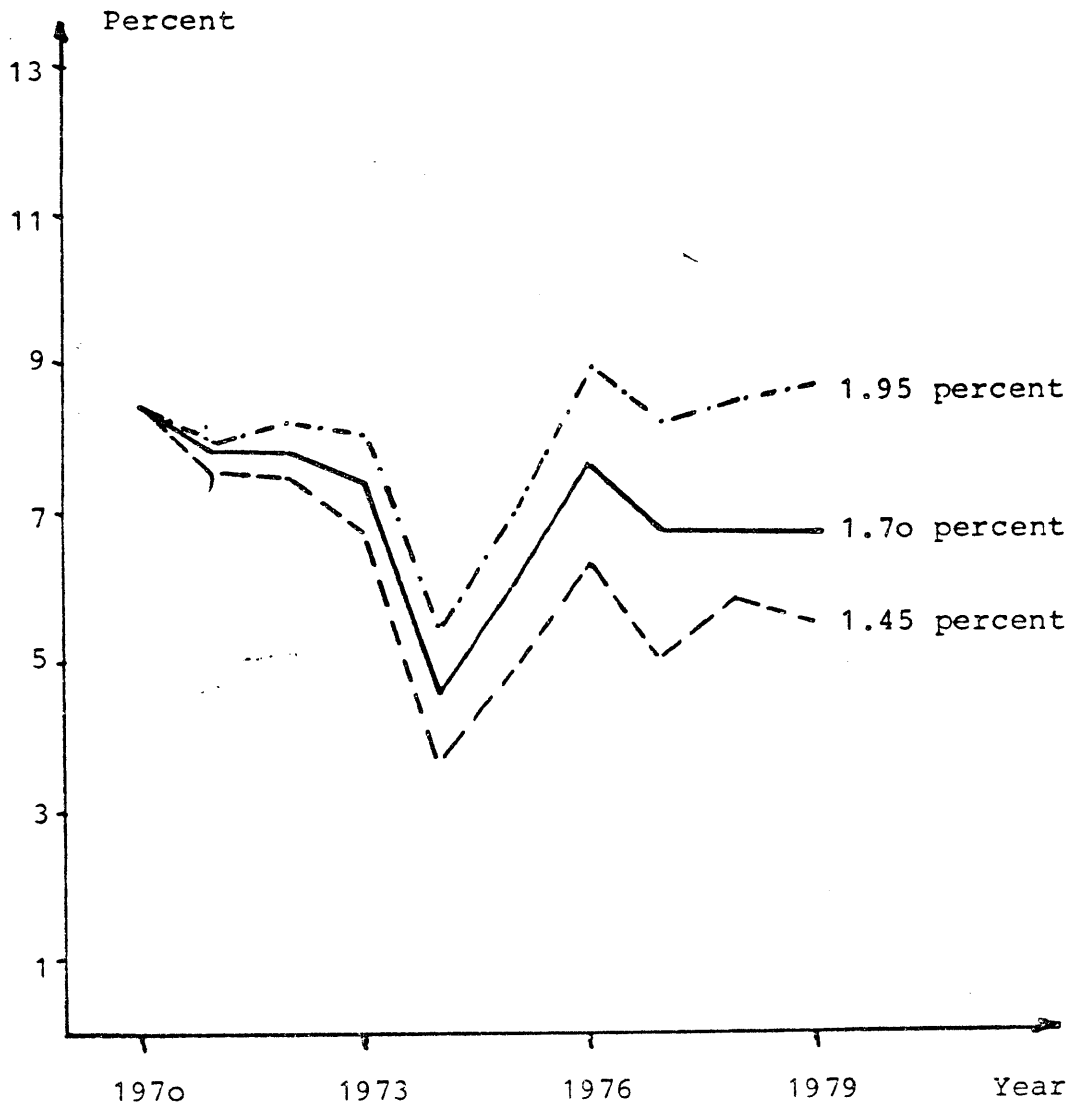Rate of Return on Total Capital before Taxes

Figure 22: Sensitivity Analysis: Technological Progress
         Rate of Return on Total Capital after Taxes
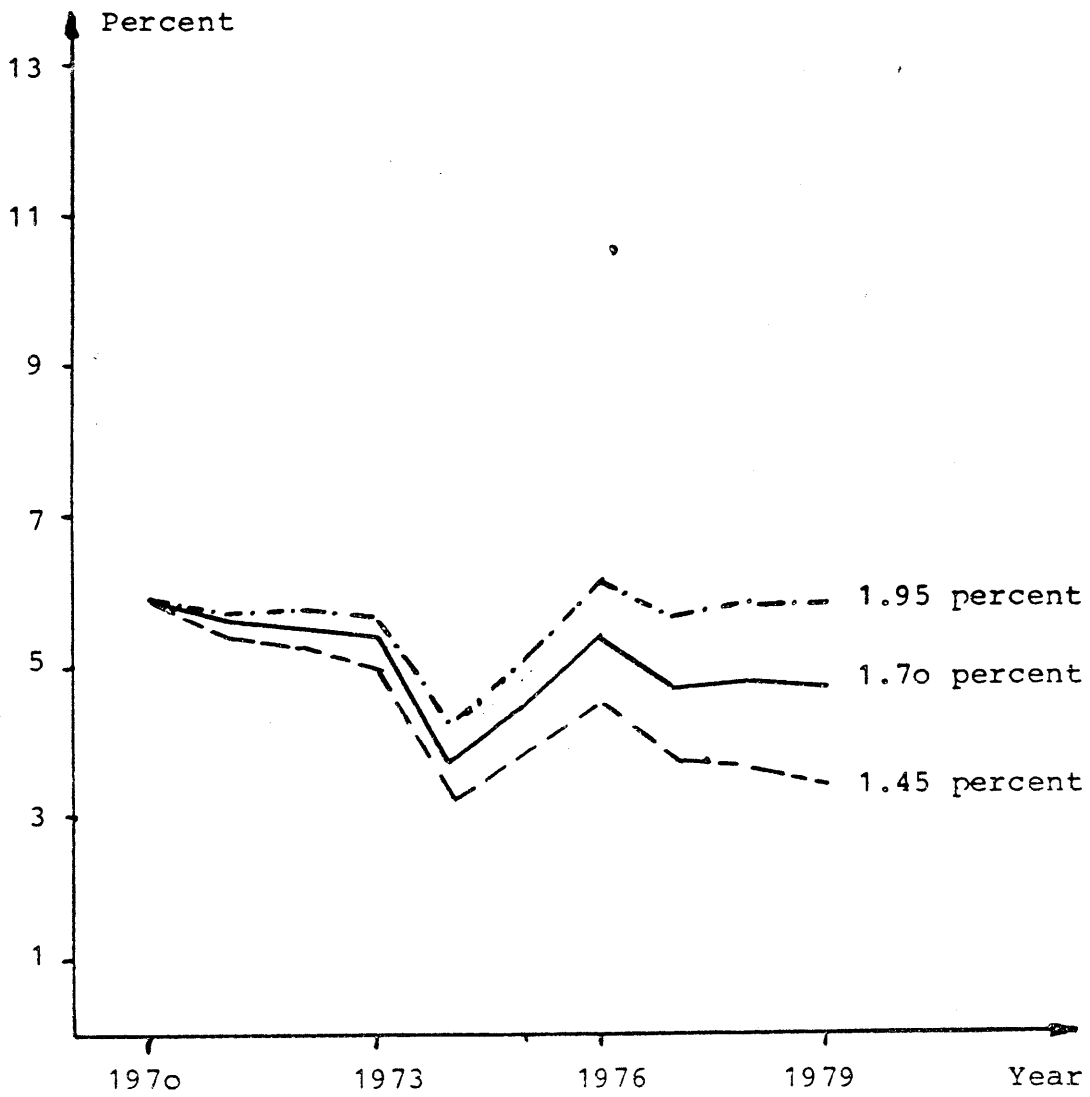
Figure 23: Sensitivity Analysis: Technological Progress
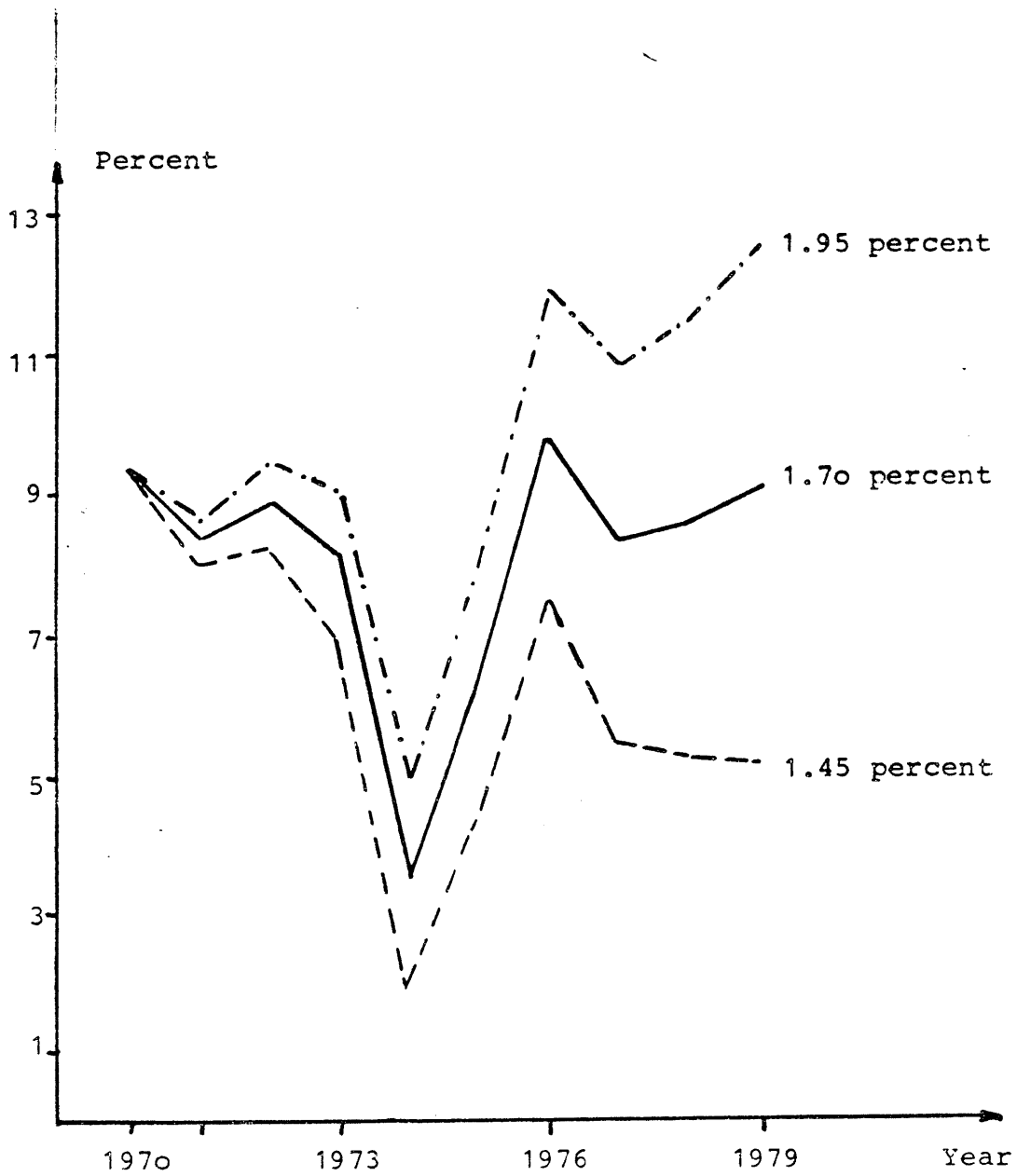Rate of Return on Equity after Taxes

Percent

13

11

9

7

5

3

1

1.95 percent

1.7o percent

1.45 percent

1970   1973   1976   1979   Year

Table 27: Sensitivity Analysis, Rate of Technological Progress

Year	Technological Progress	Model Estimates of the Rate of Return		
		Total Capital before Taxes	Total Capital after Taxes	Equity
1970	1.45	8.392	5.9o4	9.33o
1971	1.45	7.579	5.4o2	8.o33
1972	1.45	7.425	5.289	8.243
1973	1.45	6.777	4.997	7.o37
1974	1.45	3.653	3.214	1.919
1975	1.45	4.848	3.822	4.378
1976	1.45	6.295	4.542	7.519
1977	1.45	5.o48	3.748	5.551
1978	1.45	4.8o3	3.599	5.229
1979	1.45	4.5o3	3.37o	5.166

Year	Technological Progress	Model Estimates of the Rate of Return		
		Total Capital before Taxes	Total Capital after Taxes	Equity
1970	1.7	8.392	5.9o4	9.33o
1971	1.7	7.772	5.6o8	8.328
1972	1.7	7.843	5.539	8.878
1973	1.7	7.44o	5.393	8.o66
1974	1.7	4.549	3.749	3.481
1975	1.7	5.969	4.49o	6.258
1976	1.7	7.649	5.35o	9.763
1977	1.7	6.711	4.741	8.317
1978	1.7	6.744	4.76o	8.523
1979	1.7	6.688	4.676	9.o4o

Year	Technological Progress	Model Estimates of the Rate of Return		
		Total Capital before Taxes	Total Capital after Taxes	Equity
1970	1.95	8.392	5.9o4	9.33o
1971	1.95	7.959	5.72o	8.614
1972	1.95	8.243	5.781	9.492
1973	1.95	8.o78	5.774	9.o52
1974	1.95	5.4o8	4.261	4.958
1975	1.95	7.o31	5.124	8.o15
1976	1.95	8.921	6.11o	11.837
1977	1.95	8.256	5.664	1o.841
1978	1.95	8.527	5.826	11.439
1979	1.95	8.665	5.859	12.465

Finally we analyze the net effect of the rate of corporation income tax on the rate of return. The effect on the rate of return before taxes is not negligible. This is due to the fact that taxes affect investment behavior and production and thus indirectly also the rate of return before taxes. A 4o percent corporation income tax is the tax rate used in estimating the model. During the years when profitability was low a change in the tax-rate did not affect the rate of return on equity and after taxes very much. However, in the late seventies the rate of return on equity would have increased by 1 percentage point if the rate of corporation income tax had been lower by 5 percentage points. The results are given in table 28 and figures 24 to 26.

2.2.3. Forescasts of the Rate of Return for 1981 and 1982

If we make forecasts for the exogenous variables, we can forecast the rates of return with the help of our model. We will have to keep in mind that the model was estimated from actual data for the period from 197o to 1976. The actual exogenous variables for 1977 to 1979 were used to compute the endogenous variables, particularly the rates of return, for these years. The actual exogenous variables for 198o are preliminary values. The exogenous variables for 1981 and 1982 are my forecasts.

These forecasts are given in the form of two scenarios, a more pessimistic one and a more optimistic one. Table 29 shows the forecasts used in the model prognosis of the rates of return[8].

Table 28: Sensitivity Analysis: Corporation Income Tax

Year	Corporate Income Tax	Model Estimates of the Rate of Return		
		on Total Capital before Taxes	on Total Capital after Taxes	Equity after Taxe
1970	35	7.914	5.9o4	9.33o
1971	35	7.585	5.758	8.726
1972	35	7.6o7	5.676	9.255
1973	35	7.246	5.525	8.436
1974	35	4.479	3.8o6	3.645
1975	35	6.o33	4.718	6.912
1976	35	7.768	5.714	1o.792
1977	35	6.962	5.149	9.441
1978	35	7.o5o	5.2o5	9.754
1979	35	6.962	5.1o4	1o.27o

Year	Corporate Income Tax	Model Estimates of the Rate of Return		
		on Total Capital before Taxes	on Total Capital after Taxes	Equity after Taxe
1970	4o	8.392	5.9o4	9.33o
1971	4o	7.772	5.6o8	8.328
1972	4o	7.843	5.539	8.878
1973	4o	7.44o	5.393	8.o66
1974	4o	4.549	3.749	3.481
1975	4o	5.969	4.49o	6.258
1976	4o	7.649	5.35o	9.763
1977	4o	6.711	4.741	8.317
1978	4o	6.744	4.76o	8.523
1979	4o	6.688	4.676	9.o4o

Year	Corporate Income Tax	Model Estimates of the Rate of Return		
		on Total Capital before Taxes	on Total Capital after Taxes	Equity after Taxes
1970	45	8.958	5.9o4	9.33o
1971	45	7.999	5.46o	7.938
1972	45	8.129	5.4o5	8.5o9
1973	45	7.668	5.259	7.693
1974	45	4.623	3.686	3.3o1
1975	45	5.883	4.256	5.589
1976	45	7.484	4.972	8.694
1977	45	6.389	4.32o	7.149
1978	45	6.368	4.3o8	7.26o
1979	45	6.365	4.25o	7.8o2

Figure 24: Sensitivity Analysis: Corporation Income Tax
Rate of Return on Total Capital before Taxes
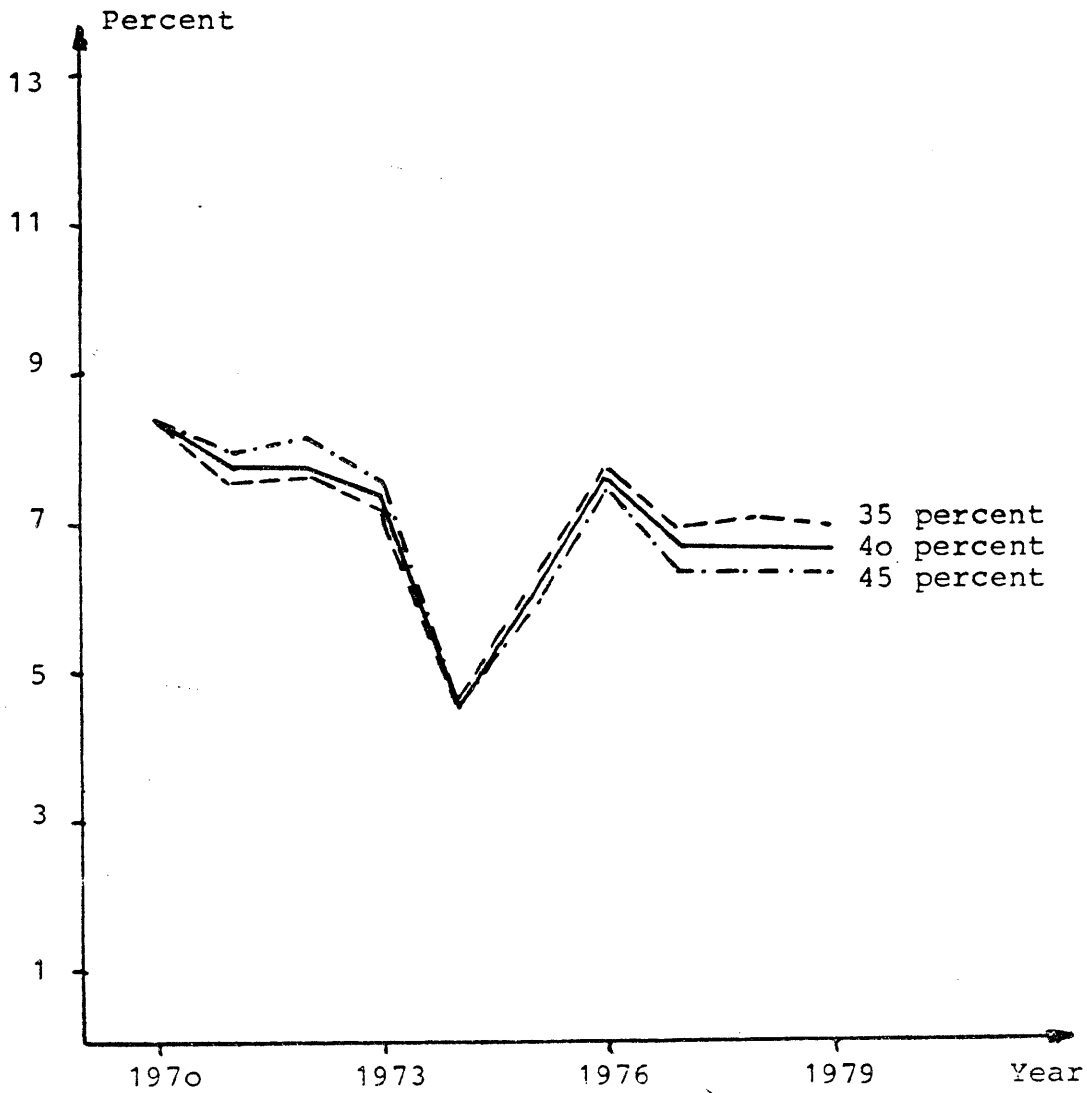
Figure 25: Sensitivity Analysis: Corporation Income Tax
Rate of Return on Total Capital after Taxes
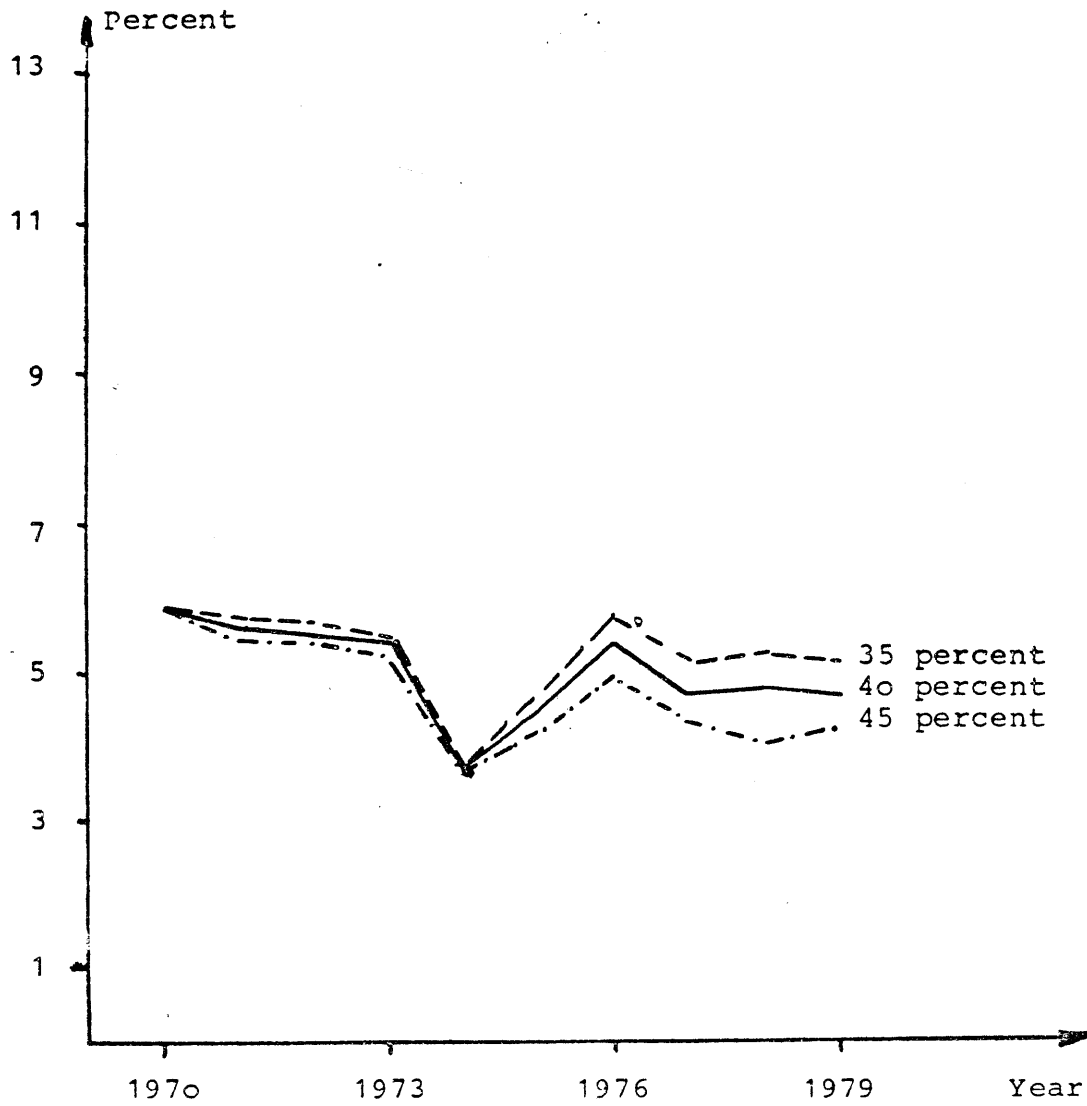
Figure 26: Sensitivity Analysis: Corporation Income Tax
Rate of Return on Equity after Taxes
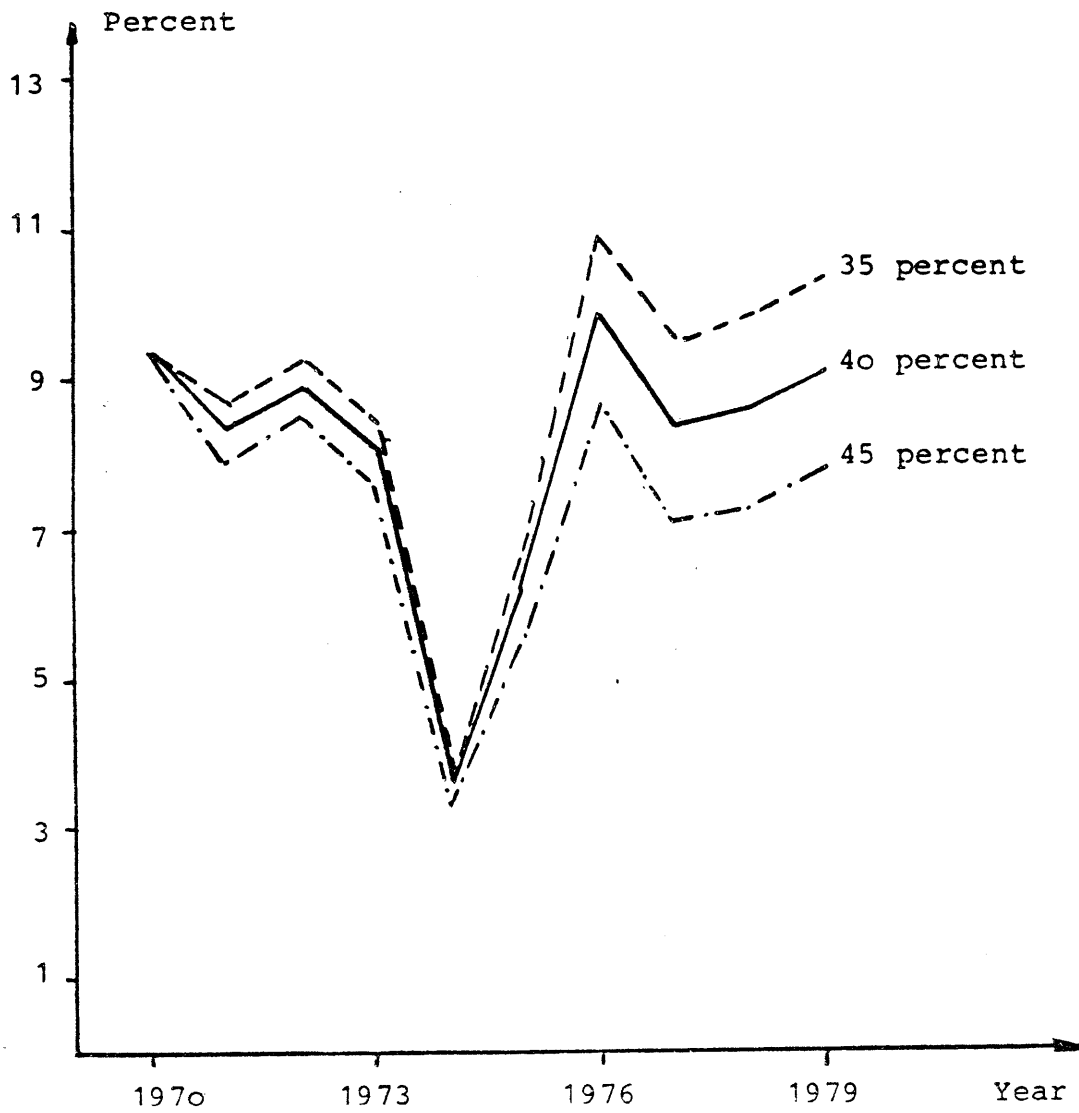
Table 29:   Forecasts of Exogenous Variables
            Growth Rate in Percent

Variable Scenario	1980 1,2	1981		1982	
		1	2	1	2
Price for Raw Materials	5.64	6.49	5.2o	6.9o	5.7o
Wages and Salaries	7.1o	5.3o	4.9o	5.4o	4.5o
Demand (real)	2.oo	-1.oo	-0.40	1.o5	3.oo
Price of Product	4.28	4.o8	4.5o	3.3o	4.oo
Price of Investment Goods	5.49	4.73	5.oo	4.8o	5.oo
Interest Rate* on Long-Term Debt	8.9o	9.6o	9.6o	8.5o	8.oo
Cost of Equity*	13.1o	12.8o	13.1o	12.8o	13.1o
Other Expenditure and Marketing Expenditures	6.87	5.22		5.56	
Actual Interest* Payment on Debt	3.4o	3.7o		3.3o	

* Absolute values

Scenario 1 is pessimistic with respect to the real growth
of the German economy. Some of the Economic Research Institutes
have forecast an even greater decrease in real growth, however.
Scenario 2 is more optimistic for 1981. The - .4 percent growth
rate is the rate forecast for GNP-growth by the Board of Econ-
omic Experts. Significant differences exist between the two
scenarios for 1982. Scenario 1 assumes that there will be
imported inflation, resulting in high wage demands, whereas growth
is too slow to allow for better capacity utilization and higher
prices for the domestic goods. The interest rate remains fairly
high. Scenario 2, on the other hand, forecasts a sharp turn in econ-
omic activity. This is brought about by more moderate wage demands,
which are followed by an increased confidence in the German
economy. This results in a revaluation of the deutschmark and
thus reduces the pressure on profitablity from raw materials
prices and oil prices fixed in dollars. Demand rises by three
percent in real terms which brings about better capacity util-
ization. This means a better bargaining position with customers
and higher prices. This, of course, results in significant im-
provements in the rate of return.

Figures 27 to 29 show the results of the model forecasts. In
the pessimistic scenario total profit continues to fall. The
rate of return on equity decreases sharply between 1981 and
picks up only slightly in 1982. In the optimistic scenario 2
profits rise to 1970 levels, while the rate of return on equity
shows a pronounced rise to a level above that of the seventies.

These forecasts underscore the sensitivity of the rate of
return of German manufacturing corporations to competition on
the one hand and to wage increases on the other. Competition
reduces the chances of increasing prices to customers, and
wage increases lead to less profitable production, reduce
the profit per unit of output and reduce the level of production.

Figure 27: Rate of Return on Total Capital before Taxes
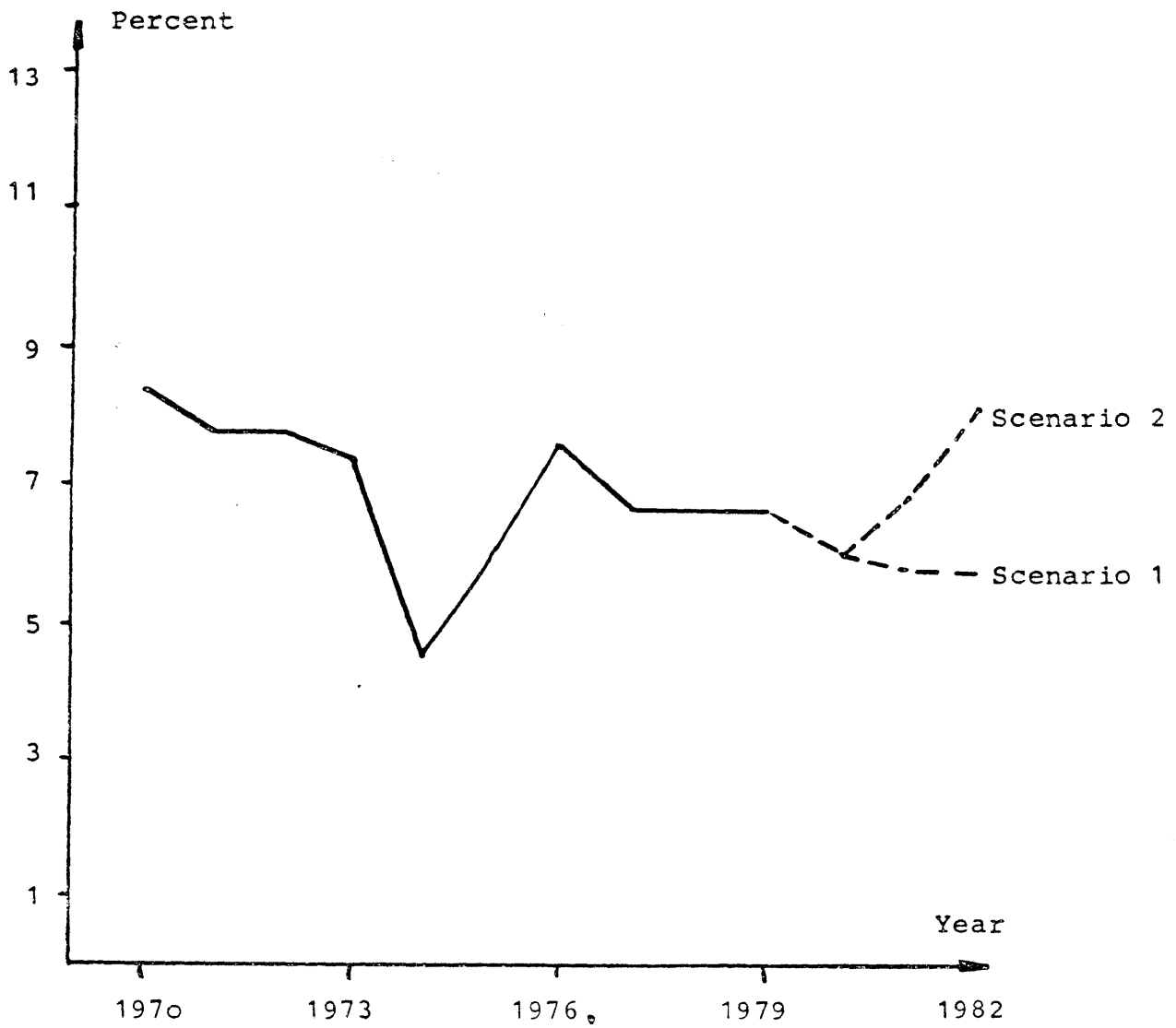
Figure 28: Rate of Return on Total Capital after Taxes
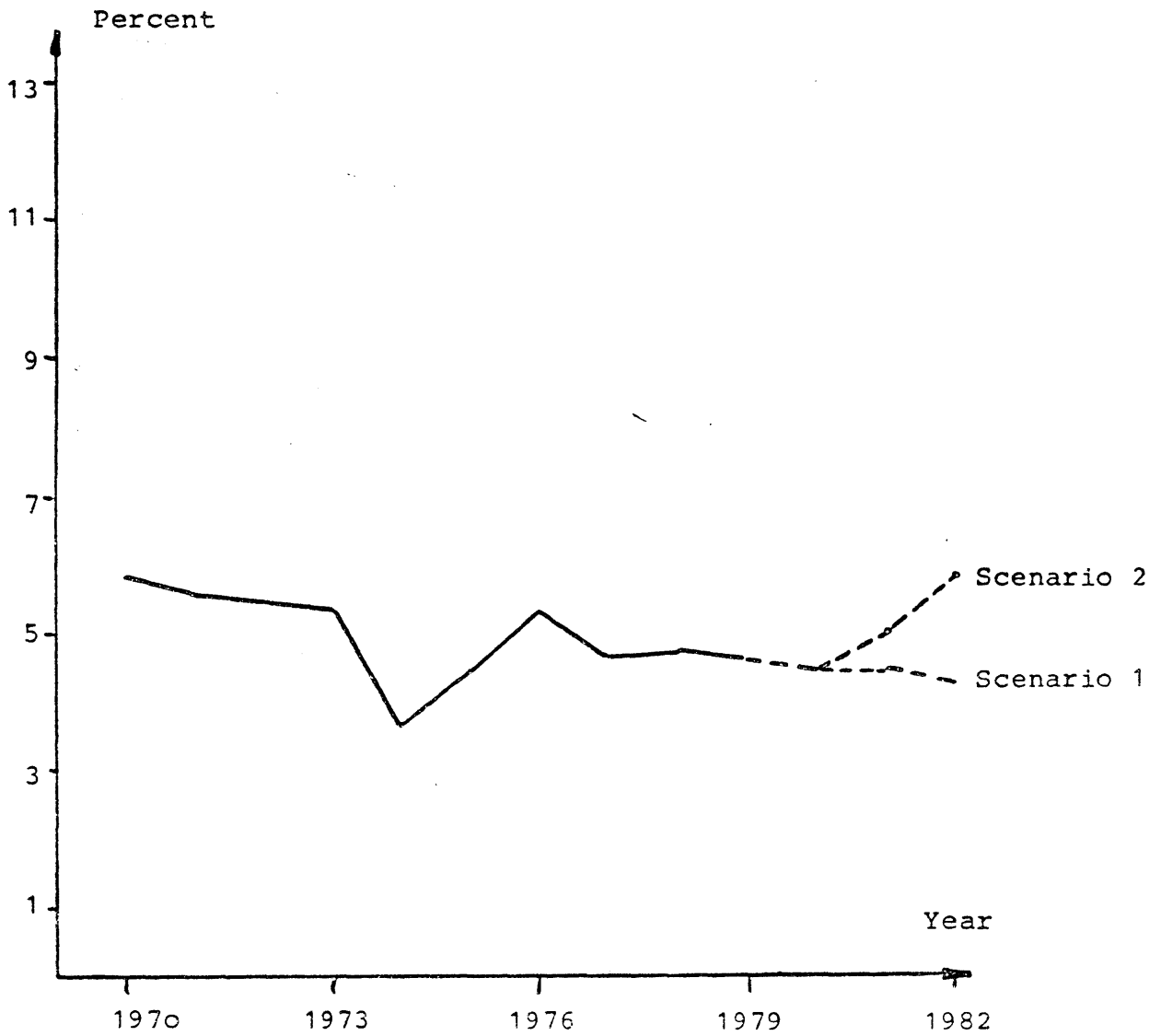
Figure 29: Rate of Return on Equity after Taxes
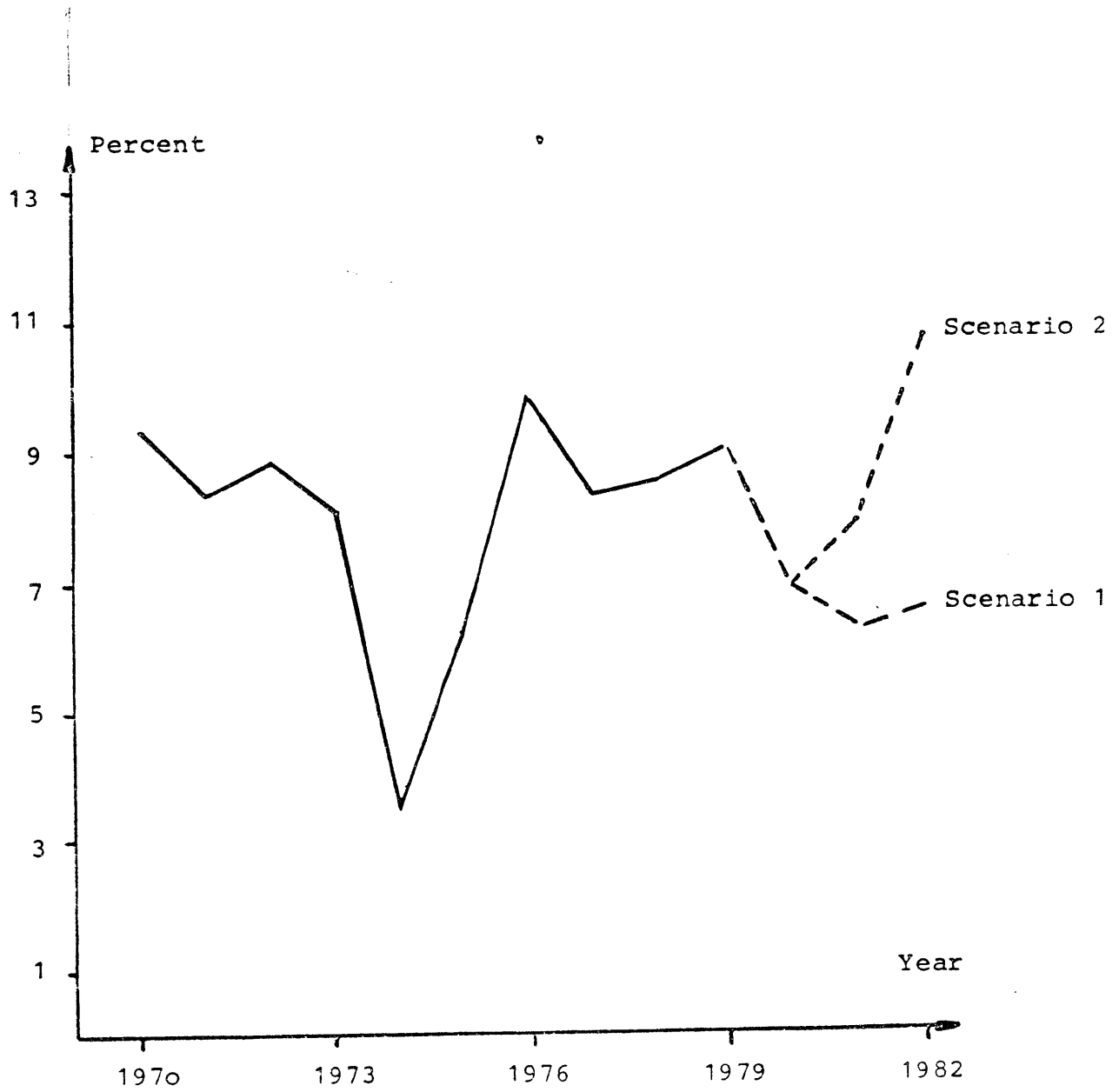
I would like to conclude by saying that the declining rates
of return on capital and on equity certainly were a phenomenon
of the seventies. They are, however, by no means a tendency
that should be considered as a given for the future. On the
contrary, they seem to me to be a combined effect of structural
changes in the world economy brought about by the break-down
of the system of fixed exchange rates and by OPEC on the one
hand and by excessive wage demands and lenient governments
on the other. The eighties might witness a change to improved
profitability. Whether the favorable conditions required for
such a reversion of the trend can be brought about in Germany
remains doubtful, however.

Foot Notes

1) For a detailed comparison of the data bank of the Central
   Bank and of the Bonn Sample see Titz, P., Statistischer
   Ansatz zur empirischen Analyse des Unternehmenssektors -
   Vergleich der Unternehmensbilanzstatistik der Deutschen
   Bundesbank mit der Bonner Stichprobe, M.A. Thesis, Bonn
   1980 (unpublished).

2) Statistisches Jahrbuch für die Bundesrepublik Deutschland,
   Annual Additions, 7.14: Financial Reports of Corporations

3) Beihefte zu den Monatsberichten der Deutschen Bundesbank,
   Reihe 2: Wertpapierstatistik, several volumes

4) The Real Rate of Return of German Corporations, Schriften-
   reihe des Instituts für Gesellschafts- und Wirtschafts-
   wissenschaften Nr. 62, Bonn 1977; see also the extensive
   description of the method in Koll. W., Inflation und Renta-
   bilität. Eine theoretische und empirische Analyse von
   Preisschwankungen und Unternehmenserfolg in den Jahresab-
   schlüssen deutscher Aktiengesellschaften, Wiesbaden 1979

5) See Appendix

7) Albach, H., Geisen, B. und Th. Fues, Approaches to a Theory
   of Income Distribution in the Firm, in: Krelle, W., H.-J.
   Krupp, O. Kyn (Hrsg.), Income Distribution and Economic
   Inequality, Frankfurt/M., New York, Forester Chicester 1978

6) Kless, H.-P., Interlocking Directorates, M.A. Thesis,
   Bonn 1980 (unpublished)

8) See Appendix 6 for the time series of exogenous variables.

Appendix 1:

Definitions of Capital, Profits and

Nominal Profitability Rates

1.1. Balance Sheet of German Corporations

Assets	Code Number

I. Fixed Assets

A. Tangible and Intangible

1. Real Estate and equivalent rights with office, factory and other buildings	120
2. Real Estate and equivalent rights with residential buildings	121
3. Real Estate and equivalent rights without buildings	122
4. Buildings on real estate not owned, not included in No. 1 or 2	123
5. Machinery, plant and equipment	125
6. Office equipment	126
7. Plant under construction and advantages for plant	127
8. Concessions, industrial proper rights, and similar rights	128

B. Investments

1. Affiliated companies	135
2. Securities, bonds, shares, not included in No.1	136
3. Loans for a term of at least four years	137
- secured by mortgages	138
4. Other monetary assets	139

II. Current Assets

A. Inventories

1. Raw materials and supplies	145
2. Work in process	146

1.2.   Profit and Loss Statement

	Sales Revenue including turnover · tax	310
–	Turnover tax	311

=	Sales Revenue	315
±	Increase / Decrease in inventories of finished and semi-finished products	316
+	Other company-manufactured capitalized items	317

=	Total Gross Revenue	320
–	Cost of raw materials and supplies	322

=	Balance	325
+	Income from profit transfer for agreement	330
+	Income from affiliates	331
+	Income from other investments	332
+	Other interest and similar income	333
+	Gains from sale of plant property and equipment and valuation adjustments	334
+	Reduction of uncollectables revenue	335
+	Reserval of accruals	336
+	Transfers from special reserves	337
+	Other income	338

–	Wages and salaries	350
–	Compulsory welfare	351
–	Pensions and assistance	352
–	Depreciation on tangible and intangible assets	353
–	Write downs and other valuation adjustments of investments	354
–	Valuation adjustment on current assets other than inventories and general reserves for accounts receivable	355
–	Loss of retirement of fixed assets	356

−	Interest and similar expenses	357
−	Taxes	
	(a) on income and property	358
	(b) other	360
−	Equalization of Burdens Property Levy	361
−	Transfer of losses of affiliates	362
−	Transfer to special items with Reserve Shares	363
−	Other expenses	364

=	Net income for the year	370
±	Profit / Loss carry forward (last year)	371
+	Drawing from reserves	373-377
−	Allotment to reserves	378-380

=	Profit available for dividend	390

Dividend on common shares	395
Dividend on preferred shares	396
Profit / Loss carry forward	397

1.3. Definitions of Capital, Profits and Nominal Profitability Rates

1.3.1. Basic Terms

- Total Capital: 190-230-231-232

- Equity Capital: 210+211+215+216+397
                                                   +0.5·220

- Debt Capital   Total Capital
                                                   - Equity Capital

- Market Value of Capital

  (= book value of debt +
     market value of equity)

  Book Value of Debt = Total Capital - Equity Capital

  Market Value of Equity = Basic Capital x Stock Price

- Net Income: 370

- Interest: 357

- Interest on Total Capital: 370+357

- Taxes: 358

- Dividends: 395+396

- Interest on Total Capital before
  Taxes: 370+357+358

Appendix 2:

The Computation of Real Rates of Return

1.1. Definition of inflationary gain

Let

A_t	: operating expenses...
WBW	: ... at replacement cost
HIST	: ... at historical cost t:...in period t
SG	: inflationary gain t-tt:...in period t-tt

then

$$SG_t := A_t^{WBW} - A_t^{HIST}$$

The computation is to be made for all tangible assets in-volved the production process.

1.2. Fixed assets

Let

SGSAV	: inflationary gain associated with fixed assets
ABSAV	: depreciation
RBW	: fixed assets net of accumulated depreciation
ABFAK	: depreciation rate depending on the for-mula of depreciation
ZSAV	: additions to fixed assets

$$RBWFAK_{t,t-tt} = \frac{ZSAV_{t-tt} - \sum_{i=0}^{tt-1} ABSAV_{t-tt+i}}{ZSAV_{t-tt}}$$

$$PSFAK_{t,t-tt} = \frac{\text{price index at period } t}{\text{price index at period } t-tt}$$

then

$$SGSAV_t: \quad = A_t^{WBW} - A_t^{HIST}$$

$$= ABSAV_t^{WBW} - ABSAV_t^{HIST}$$

$$= AFAK_t \, (RBW_t^{WBW} - RBW_t^{HIST})$$

$$= AFAK_t \sum_{i=0}^{ND} ZSAV_{t-i} \; RBWFAK_{t,t-i} \; PSFAK_{t,t-i}$$

with ND : economic life time of assets

Remark:

It is assumed that the depreciation at current cost will be reinvested immediately to bear an interest. Otherwise depreciation at current cost will not cover total replacement cost of the asset at a later replacement data.

1.3. Inventories

The inflationary gain depends on the stock valuation method used. Here a formula is derived which applies to the periodic weighted average method because the latter is standard in German practice. To simplify presentation it is assumed that real quantities of stocks and flows are constant.

Let

SGVOR : inflationary gain from inventories

VOR_{t-1} : beginning inventory for period t

VOR_t : ending inventory for period t

COGS : cost of goods sold

PSVOR : rate of price change given for the periodic average method by

$$PSVOR_t \; := \; \frac{VOR_t + COGS_t}{VOR_{t-1} + COGS_{t-1}} - 1$$

then $\qquad SGVOR_t \quad := \quad A_t^{WBW} \quad - \quad A_t^{HIST}$

$$= \quad VOR_t \quad - \quad VOR_{t-1}$$

$$= \quad VOR_{t-1} \; (1+ PSVOR_t) - VOR_{t-1}$$

$$= \quad VOR_{t-1} \; PSVOR_t$$

1.4. Securities of affiliates

Inflationary gains are also contained in dividends from securities of affiliates. Its is assumed that the securities represent a part of the assets of these affiliates and that these assets "produce" inflationary gains for the same reasons and in the same composition as assets in the parent company do.

Let

SGBET : inflationary gain from affiliates

AV : fixed assets

UV : current assets

BET : securities of affiliates

then

$$SGBET_t \quad = \quad \frac{SGSAV_t + SGVOR_t}{AV_t + UV_t} \quad BET_t$$

1.5. Total inflationary gain

Let

SG   : total inflationary gain

then

$$SG_t \quad = \quad SGSAV_t + SGVOR_t + SGBET_t$$

1.6. Net concept

In accordance with the net concept the inflationary gain has to be distributed between equity and debt capital. Here the following method in applied

Let

EK   : equity capital

FK   : debt capital

SGEK   : inflationary gain arisen from equity-financed asset

SGFK   : inflationary gain arisen from debt-financed assets

Distribution by structure of assets

Let $AV_t < EK_t < AV_t + BET_t$

then $SGEK_t \quad = \quad SGSAV_t + \dfrac{EK_t - AV_t}{BET_t} \quad SGBET_t$

with $SGFK_t \quad = \quad SG_t \quad - \quad SGEK_t$

1.7. Final remark

The so computed inflationary gain represents a self-refinancing gap which may be filled by charging this amount in addition to operating expenses computed at historical cost. An adequate operating cash flow is a necessary condition.

1.8. Definition of Real Profitability Rates

- <u>Real Rate of Return on Capital before Taxes</u>

$$\frac{\text{Interest on Capital before Taxes} - \text{SG}}{\text{Total Capital} + \text{DWSAV}}$$

DWSAV: valution difference at fixed assets
= fixed assets at replacement cost minus fixed assets at historical cost

- <u>Real Rate of Return on Capital after Taxes:</u>

$$\frac{\text{Interest on Total Capital} - \text{SG}}{\text{Total Capital} + \text{DWSAV}}$$

- <u>Real Rate of Return on Equity before Taxes:</u>

$$\frac{\text{Net Income} + \text{Taxes} - \text{SGEK}}{\text{Equity Capital} + \text{DWSAV}}$$

- <u>Real Rate of Return on Equity after Taxes:</u>

$$\frac{\text{Net Income} - \text{SGEK}}{\text{Equity Capital} + \text{DWSAV}}$$

Appendix 3 :   Nominal Rate of Return on Equity after Taxes
                      1oo Manufacturing Corporations

Year	Unweighted means
1952	.73
1953	3.46
1954	3.75
1955	6.o7
1956	7.34
1957	7.2o
1958	7.31
1959	1o.o4
196o	11.59

Appendix 4 : Distribution of Value Added

The computation of value added is based on distribution.
The gross wages are computed as the sum of wages and salaries,
compulsory welfare and pensions and assistance, the creditors
share are interest and similar payments, the shareholders income
is the corporation's net income for the year, the net-capital
share is the amount distributed among creditors and share-
holders. Business taxes on profits and assets are all corporate
taxes. All ratios are related to the total sum of the value
added. They are computed on data of individual income state-
ments and are therefore unweighted averages of the corporations
of the Bonn Sample.

Appendix 5 :

Determinants of the Rate of Return
- Regression Analysis -

Table 1: Regression Coefficients, Nominal Rate of Return on Total Capital after Taxes

- Automobile Industry -

Equation	Constants			Trend	Growth Rate	Inflation Rate	R^2
	1961–1979	1961–1968	1969–1979		of GNP		
Equation 1	6.11	-----	-----	.028	.200	-.382	.3372
				(0.42)	(1.61)	(1.61)	
Equation 2	-----	5.112	3.571	.131	.271	-.227	.3837
		(3.26)	(1.29)	(1.09)	(1.67)	(0.81)	
Equation 3	-----	4.847	-----	.046	.027	.416	.3666
		(4.61)		(0.53)	(0.31)	(1.50)	
Equation 4	-----	-----	-.433	.282	.556	-.043	.4778
			(0.20)	(2.27)	(3.52)	(0.14)	
Equation 5	4.84	-----	-----	-.021	.283	-----	.2231
				(0.34)	(1.96)		
Equation 6	7.36	-----	-----	.023	-----	-.496	.2552
				(0.34)		(2.17)	

t-values are given in brackets

Table 2: Regression Coefficients, Nominal Rate of Return on Equity after Taxes

- Automobile Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979				
Equation 1	13.82	-----	-----	.121	.765	-1.290	.2658
				(0.43)	(1.25)	(1.30)	
Equation 2	-----	11.542	8.014	.357	.927	-.932	.2814
		(1.72)	(0.68)	(0.69)	(1.34)	(0.78)	
Equation 3	-----	19.360	-----	-1.455	.004	.681	.6799
		(2.76)		(2.52)	(0.007)	(0.37)	
Equation 4	-----	-----	.564	.979	1.148	-1.377	.6212
			(0.08)	(2.56)	(2.35)	(1.46)	
Equation 5	9.53	-----	-----	-.044	1.044	----	.1834
				(0.17)	(1.78)		
Equation 6	18.60	-----	-----	.103	-----	-1.722	.1896
				(0.36)		(1.82)	

t-values are given in brackets

Table 3 : Regression Coefficients, Real Rate of Return on Total Capital after Taxes
– Automobile Industry –

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1968-1979				
Equation 1 OLS	5.71	-----	-----	.175 (1.30)	.182 (0.62)	-1.302 (2.73)	.4099
OLSDV	6.44	-----	-----	.015 (0.22)	.169 (1.14)	-1.070 (4.44)	.4936
Equation 2	-----	5.281 (2.37)	3.580 (0.91)	.108 (0.63)	.209 (0.91)	- .398 (2.35)	.5925
Equation 3	-----	4.137 (3.65)	-----	.165 (1.77)	-.045 (0.48)	- .186 (0.62)	.5878
Equation 4	-----	-----	-1.000 (0.30)	.249 (1.29)	.570 (2.32)	- .658 (1.38)	.5513
Equation 5 OLS	1.37	-----	-----	.008 (0.06)	.464 (1.42)	-----	.1166
OISDV	2.90	-----	-----	-.122 (1.84)	.400 (2.61)	-----	.3786
Equation 6 OLS	6.85	-----	-----	.171 (1.30)	-----	-1.405 (3.21)	.3950
OLSDV	7.50	-----	-----	.011 (0.16)	-----	-1.160 (5.16)	.4861

OLS – Ordinary least squares estimation, OLSDV – Ordinary least squares method with dummy variables
t-values are given in brackets   for the individual firms

Table 4 :   Regression Coefficients, Real Rates of Return on Equity after Taxes
- Automobile Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1968-1979				
Equation 1							
OLS	10.10	-----	-----	-.106	.531	1.171	.5391
				(0.69)	(1.58)	(2.15)	
OLSDV	10.42	-----	-----	-.073	.680	-1.220	.4806
				(0.44)	(1.84)	(2.05)	
Equation 2	-----	8.207	5.465	.073	.649	-.873	.5582
		(2.27)	(0.86)	(0.26)	(1.74)	(1.35)	
Equation 3	-----	12.150	-----	-.684	.002	-.039	.6368
		(3.58)		(2.44)	(0.005)	(0.04)	
Equation 4	-----	-----	-1.018	.415	1.025	-.802	.6828
			(0.26)	(1.80)	(3.49)	(1.41)	
Equation 5							
OLS	6.19	-----	-----	-.256	.785	-----	.3969
				(1.69)	(2.25)		
OISDV	6.32	-----	-----	-.230	.945	-----	.4556
				(1.51)	(2.69)		
Equation 6							
OLS	13.40	-----	-----	-.118	-----	-1.472	.4627
				(0.74)		(2.76)	
OLSDV	14.66	-----	-----	-.089	-----	-1.608	.4603
				(0.52)		(2.84)	

OLS - Ordinary least squares estimation, OLSDV - Ordinary least squares method with dummy variables
t-values are given in brackets   for the individual firms

Table 5: Regression Coefficients, Nominal Rate of Return on Total Capital after Taxes
- Electrotechnical Industry -

Equation	Constants			Trend	Growth Rate	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979		of GNP		
Equation 1	6.06	-----	-----	-.138	.016	.011	.4890
				(3.26)	(0.17)	(0.08)	
Equation 2	-----	6.647	7.547	-.199	-.025	-.079	.5193
		(6.64)	(4.29)	(2.58)	(0.24)	(0.44)	
Equation 3	-----	5.414	-----	.150	-.152	-.004	.8125
		(7.61)		(2.56)	(2.58)	(0.02)	
Equation 4	-----	-----	7.895	-.305	.086	.079	.8852
			(6.36)	(5.98)	(1.07)	(0.67)	
Equation 5	6.10	-----	-----	-.137	.014	-----	.4888
				(3.74)	(0.16)		
Equation 6	6.17	-----	-----	-.139	-----	.002	.4879
				(3.38)		(0.02)	

t-values are given in brackets

Table 6 : Regression Coefficients, Nominal Rate of Return on Equity after Taxes

- Electrotechnical Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979				
Equation 1	10.90	-----	-----	-.352	.274	.355	.3722
				(2.59)	(0.92)	(0.73)	
Equation 2	-----	11.393	12.148	-.403	.239	.279	.3747
		(3.45)	(2.09)	(1.59)	(0.70)	(0.47)	
Equation 3	-----	13.178	-----	.313	-.453	-.543	.7673
		(5.79)		(1.67)	(2.40)	(0.90)	
Equation 4	-----	-----	7.095	-.545	.969	1.224	.8224
			(1.48)	(2.76)	(3.11)	(2.68)	
Equation 5	12.09	-----	-----	-.307	.197	-----	.3497
				(2.57)	(0.71)		
Equation 6	12.61	-----	-----	-.359	-----	.199	.3370
				(2.65)		(0.44)	

t-values are given in brackets

Table 7 : Regression Coefficients, Real Rate of Return on Total Capital after Taxes
- Electrotechnical Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1968-1979				
Equation 1							
OLS	7.73	-----	-----	-.027	-.067	-.353	.2904
				(0.51)	(0.58)	(1.88)	
OLSDV	6.52	-----	-----	-.173	-.049	-.545	.4641
				(5.21)	(0.67)	(4.61)	
Equation 2	-----	7.042	7.959	-.226	-.087	-.641	.6588
		(4.77)	(3.07)	(2.00)	(0.57)	(2.42)	
Equation 3	-----	5.428	-----	.224	-.180	-.651	.9517
		(8.95)		(4.49)	(3.57)	(4.07)	
Equation 4	-----	-----	9.090	-.382	-.005	-.481	.6999
			(2.97)	(3.04)	(0.03)	(1.65)	
Equation 5							
OLS	6.55	-----	-----	.072	.009	-----	.1229
				(1.43)	(0.08)		
OISDV	4.71	-----	-----	-.243	.069	-----	.4058
				(7.81)	(0.97)		
Equation 6							
OLS	7.31	-----	-----	-.025	-----	-.315	.2744
				(049)		(1.83)	
OLSDV	6.22	-----	-----	-.172	-----	-.517	.4629
				(5.19)		(4.68)	

OLS - Ordinary least squares estimation, OLSDV - Ordinary least squares method with dummy variables
t-values are given in brackets   for the individual firms

Table 8 : Regression Coefficients, Real Rates of Return on Equity after Taxes
-Electrotechnical Industry-

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1968-1979				
Equation 1							
OLS	13.85	-----	-----	-.334 (3.68)	-.074 (0.37)	-.314 (0.97)	.6136
OLSDV	11.09	-----	-----	-.535 (4.38)	.185 (0.69)	-.611 (1.41)	.3359
Equation 2	-----	10.646 (3.52)	11.757 (2.21)	-.537 (2.31)	.029 (0.09)	-.305 (0.56)	.5994
Equation 3	-----	11.618 (6.46)	-----	.311 (2.10)	-.451 (3.02)	-1.382 (2.91)	.8909
Equation 4	-----	-----	9.425 (3.64)	-.782 (7.34)	.567 (3.37)	.516 (2.09)	.9408
Equation 5							
OLS	12.81	-----	-----	-.374 (4.64)	-.006 (0.03)	-----	.5892
OISDV	9.04	-----	-----	-.613 (5.63)	.317 (1.26)	-----	.3292
Equation 6							
OLS	13.39	-----	-----	-.332 (3.77)	-----	-.271 (0.92)	.6100
OLSDV	12.24	-----	-----	-.540 (4.43)	-----	-.716 (1.76)	.3343

OLS - Ordinary least squares estimation, OLSDV - Ordinary least squares method with dummy variables
t-values are given in brackets   for the individual firms

Table 9 : Regression Coefficients, Nominal Rate of Return on Total Capital after Taxes

- Steel Industry -

Equation	Constants			Trend	Growth Rate	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979		of GNP		
Equation 1	3.54	-----	-----	-.013	.080	.010	.0333
				(0.23)	(0.64)	(0.50)	
Equation 2	-----	5.037	7.348	-.168	-.026	-.132	.2472
		(4.16)	(3.45)	(1.80)	(0.21)	(0.61)	
Equation 3	-----	3.686	-----	-.078	.030	.143	.1114
		(1.80)		(0.46)	(0.18)	(0.26)	
Equation 4	-----	-----	8.682	-.209	-.105	-.232	.2871
			(2.66)	(1.56)	(0.49)	(0.74)	
Equation 5	3.88	-----	-----	.00002	.058	-----	.0174
				(0.0005)	(0.51)		
Equation 6	4.04	-----	-----	-.015	.054	-.054	.0065
				(0.26)	(0.29)	(0.29)	

t-values are given in brackets

Table 1o: Regression Coefficients, Nominal Rate of Return on Equity after Taxes

- Steel Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979				
Equation 1	4.37	-----	-----	-.251 (1.50)	.491 (1.34)	.280 (0.47)	.2550
Equation 2	-----	8.990 (2.55)	16.136 (2.60)	-.729 (2.69)	.164 (0.45)	-.439 (0.69)	.4361
Equation 3	-----	6.235 (1.24)	-----	-.649 (1.57)	.461 (1.11)	.010 (0.008)	.5514
Equation 4	-----	-----	20.26 (2.04)	-.817 (2.00)	-.165 (0.26)	-.805 (0.85)	.4350
Equation 5	5.30	-----	-----	-.215 (1.48)	.430 (1.29)	-----	.2440
Equation 6	7.43	-----	-----	-.262 (1.54)	-----	.0007 (0.001)	.1657

t-values are given in brackets

Table 11: Regression Coefficients, Real Rate of Return on Total Capital after Taxes

- Steel Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1968-1979				
Equation 1							
OLS	7.06	-----	-----	-.001 (0.03)	-.079 (0.78)	-.353 (2.17)	.2881
OLSDV	4.74	-----	-----	-.055 (1.37)	-.065 (0.74)	-.601 (4.21)	.3265
Equation 2	-----	5.616 (5.84)	7.218 (4.26)	-.157 (2.13)	-.124 (1.25)	-.758 (4.40)	.7168
Equation 3	-----	3.478 (1.82)	-----	-.059 (0.38)	-.015 (0.09)	-.277 (0.55)	.0785
Equation 4	-----	-----	9.380 (4.54)	-.209 (2.47)	-.271 (2.02)	-.951 (4.84)	.8039
Equation 5							
OLS	5.88	-----	-----	-.047 (1.03)	-.002 (0.02)	-----	.0655
OISDV	2.74	-----	-----	-.132 (3.51)	.065 (0.75)	-----	.2515
Equation 6							
OLS	6.57	-----	-----	.0004 (0.009)	-----	-.308 (2.04)	.2591
OLSDV	4.34	-----	-----	-.053 (1.33)	-----	-.564 (4.22)	.3242

OLS - Ordinary least squares estimation, OLSDV - Ordinary least squares method with dummy variables
t-values are given in brackets   for the individual firms

Table 12: Regression Coefficients, Real Rates of Return on Equity after Taxes
- Steel Industry -

Equation	Constants			Trend	Growth Rate	Inflation Rate	R^2
	1961-1979	1961-1968	1968-1979		of GNP		
Equation 1							
OLS	8.72	-----	-----	-.313	.169	.173	.5867
				(3.97)	(0.98)	(0.62)	
OLSDV	3.03	-----	-----	-.302	.316	.074	.2375
				(3.69)	(1.76)	(0.25)	
Equation 2	-----	5.291	8.778	-.541	.169	-.277	.5928
		(2.29)	(2.16)	(3.05)	(0.71)	(0.67)	
Equation 3	-----	3.753	-----	-.474	.326	-.053	.5054
		(0.95)		(1.46)	(1.00)	(0.05)	
Equation 4	-----	-----	11.070	-.598	-.004	.464	.5297
			(1.77)	(2.32)	(0.01)	(0.78)	
Equation 5							
OLS	9.30	-----	-----	-.291	.132	-----	.5762
				(4.23)	(0.83)		
OLSDV	3.27	-----	-----	-.293	.300	-----	.2372
				(4.03)	(1.79)		
Equation 6							
OLS	9.77	-----	-----	-.317	-----	.076	.5604
				(4.03)		(0.29)	
OLSDV	4.98	-----	-----	-.310	-----	-.106	.2227
				(3.76)		(0.38)	

OLS - Ordinary least squares estimation, OLSDV - Ordinary least squares method with dummy variables
t-values are given in brackets   for the individual firms

Table 13: Regression Coefficients, Nominal Rate of Return on Total Capital after Taxes

- Machinery Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979				
Equation 1	4.44	-----	-----	-.122	-.013	.209	.5874
				(4.62)	(0.23)	(2.23)	
Equation 2	-----	5.16	6.282	-.197	-.065	.096	.6858
		(9.21)	(6.37)	(4.58)	(1.12)	(0.96)	
Equation 3	-----	5.656	-----	-.147	-.056	-.197	.4177
		(5.27)		(1.66)	(0.63)	(0.70)	
Equation 4	-----	-----	6.325	-.225	-.051	.160	.8026
			(5.24)	(4.53)	(0.65)	(1.39)	
Equation 5	5.13	-----	-----	-.095	-.059	-----	.4510
				(3.62)	(0.96)		
Equation 6	4.35	-----	-----	-.122	-----	.216	.5859
				(4.76)		(2.54)	

t-values are given in brackets

Table 14: Regression Coefficients, Nominal Rate of Return on Equity after Taxes

- Machinery Industry -

Equation	Constants			Trend	Growth Rate	Inflation Rate	R^2
	1961-1979	1961-1968	1969-1979		of GNP		
Equation 1	12.41	-----	-----	-.376	.084	-.295	.7867
				(5.47)	(0.56)	(1.21)	
Equation 2	-----	13.90	16.20	-.531	-.021	-.527	.8183
		(9.00)	(5.97)	(4.47)	(0.13)	(1.90)	
Equation 3	-----	15.368	-----	-.516	-.149	-.915	.4889
		(4.67)		(1.90)	(0.55)	(1.05)	
Equation 4	-----	-----	14.456	-.516	.135	-.318	.7592
			(4.10)	(3.56)	(0.59)	(0.95)	
Equation 5	11.42	-----	-----	-.414	.148	-----	.7660
				(6.67)	(1.03)		
Equation 6	12.93	-----	-----	-.378	-----	-.343	.7823
				(5.63)		(1.53)	

t-values are given in brackets

Table 15: Regression Coefficients, Real Rate of Return on Total Capital after Taxes
- Machinery Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1968-1979				
Equation 1 OLS	7.55	-----	-----	.494 (4.12)	-.150 (0.57)	-1.480 (3.47)	.5741
OLSDV	4.00	-----	-----	-.174 (5.06)	.025 (0.33)	-.237 (1.94)	.2017
Equation 2	-----	5.496 (5.62)	6.566 (3.82)	-.218 (2.90)	-.112 (1.11)	-.498 (2.84)	.7366
Equation 3	-----	5.352 (3.48)	-----	-.058 (0.46)	-.104 (0.81)	-.735 (1.81)	.4962
Equation 4	-----	-----	7.189 (3.76)	-.287 (2.97)	-.105 (0.69)	-.429 (1.92)	.6550
Equation 5 OLS	2.63	-----	-----	.305 (2.20)	.170 (0.53)	-----	.2320
OLSDV	3.21	-----	-----	-.205 (6.66)	.076 (1.07)	-----	.1957
Equation 6 OLS	6.61	-----	-----	.497 (4.25)	-----	-1.391 (3.57)	.5648
OLSDV	4.16	-----	-----	-.175 (5.09)	-----	-.251 (2.19)	.2015

OLS - Ordinary least squares estimation, OLSDV - Ordinary least squares method with dummy variables
t-values are given in brackets   for the individual firms

Table 16 : Regression Coefficients, Real Rates of Return on Equity after Taxes
- Machinery Industry -

Equation	Constants			Trend	Growth Rate of GNP	Inflation Rate	R^2
	1961-1979	1961-1968	1968-1979				
Equation 1 OLS	13.53	-----	-----	-.181 (3.42)	-.152 (1.31)	-.958 (5.11)	.8293
OLSDV	6.80	-----	-----	-.486 (5.57)	.076 (0.40)	.017 (0.05)	.1759
Equation 2	-----	10.374 (6.59)	11.416 (4.12)	-.480 (3.97)	-.077 (0.47)	-.700 (2.48)	.8532
Equation 3	-----	11.928 (3.86)	-----	-.360 (1.41)	-.229 (0.89)	-1.264 (1.55)	.4811
Equation 4	-----	-----	9.738 (2.91)	-.504 (3.67)	.114 (0.52)	-.414 (1.30	.7769
Equation 5 OLS	10.34	-----	-----	-.303 (4.03)	.056 (0.32)	-----	.5318
OISDV	6.86	-----	-----	-.484 (6.23)	.072 (0.40)	-----	.1759
Equation 6 OLS	12.58	-----	-----	-.177 (3.29)	-----	-.872 (4.86)	.8097
OLSDV	7.28	-----	-----	-.4.88 (5.60)	-----	-.026 (0.09)	.1756

OLS - Ordinary least squares estimation, OLSDV - Ordinary least squares method with dummy variables
t-values are given in brackets   for the individual firms

Appendix 6: Time Series of Exogenous Variables

Growth Rate in Percent

Year / Variable	1971	1972	1973	1974	1975	1976	1977	1978	1979
Price for Raw Materials	2.oo	1.96	7.79	3o.24	1.37	4.o5	1.65	1.9o	6.23
Wages and Salaries	11.oo	8.92	1o.42	1o.19	7.89	6.36	7.11	5.31	5.78
Demand(real)	2.86	3.19	3.o1	- .3o	-2.57	2.64	2.8o	3.5o	4.5o
Price of Product	2.95	3.22	6.o7	12.74	4.4o	4.28	1.35	1.94	3.94
Price of Investment Goods	7.9o	3.71	4.56	9.o6	8.62	4.33	4.15	2.99	3.42
Interest Rate on Long-Term Debt*	8.5o	8.4o	1o.oo	11.oo	8.9o	8.oo	7.oo	6.8o	7.8o
Cost of Equity*	13.5o	13.1o	13.oo	13.8o	13.7o	12.8o	13.1o	13.6o	13.7o
Other Expenditures and Marketing Exp.	9.98	-1.24	17.3o	17.63	-1.35	8.41	8.13	6.41	6.99
Actual Interest Payment on Debt*	3.9	3.4	3.7	3.9	3.5	2.9	2.8	2.7	2.5

* absolute values