MEASUREMENT OF PERFORMANCE PARAMETERS FOR THE ISRAELI INDUSTRY

Technion — Israel Institute of Technology
THE SAMUEL NEAMAN INSTITUTE FOR
ADVANCED STUDIES IN SCIENCE AND TECHNOLOGY

The S. Neaman Institute for Advanced Studies in Science and Technology

MEASUREMENT OF PERFORMANCE PARAMETERS FOR THE ISRAELI INDUSTRY

Dr. Gilead Fortuna
Prof. Reuel Shinnar

Haifa, August 1992

The views expressed are attributable solely to the authors of this publication and do not necessarily reflect those of the views of the S. Neaman Institute

Copyright© 1992, the S. Neaman Institute for Advanced Studies in Science and Technology.

Published, August 1992.
The S. Neaman Institute, Technion City,
Haifa, Israel

MEASUREMENT OF PERFORMANCE PARAMETERS FOR THE ISRAELI INDUSTRY

Dr. Gilead Fortuna

Professor Reuel Shinnar

EXECUTIVE SUMMARY

Encouraging industrial investments is of special interest to Israel. For investments to be successful in the long run they require a sound return to the investors. In deciding on new investment the predicted economic return rate generated by the investment is often used as a measurement for its attractiveness. However there is a lack of data for the actual inflation adjusted return on investment for industrial companies. Professor Shinnar developed a method for estimating the actual economic return. The method has been applied to a cross section of American industry.

In this report the actual return on investment (ROI) for selected Israeli companies is evaluated for as far backwards as data from the yearly reports are available. The rates of return are independent of the source of the capital applied. As such, they are of special interest in Israel where government support is significant.

Inflation adjusted results are obtained for seven major industries in the Chemical, Electrical, Pharmaceutical, Textile and Aerospace sectors, with emphasis on the export oriented industries. The rates of returns in major Israel industries are, on the average, similar to their American equivalents, but the fluctuation of the returns for the Israeli industry are bigger. Most of the Israeli companies showed a strong decline of the inflation adjusted return on investment during the period of high inflation, recovering in the late 1980's. Many U.S. industries also showed decline in the end of the 1970's and the beginning of the 1980's, (see Table S1) but had a good return during the mid eighties.

Other conventional measures such as return on equity (ROE) are of little use when inflation rates are high, and give a completely distorted picture of the health of a company.

To illustrate our method, the results of ROI and ROE are given in figure S1 for Elbit and Teva. Figure S2 compares the ROI of Elbit and Teva with Intel and Merck. Results for five other companies, spanning the whole range of major industries in Israel, are given in Table S2 for ROI and Table S3 for ROE. One should be careful to compare the different companies in Table S2. Each operates in a different industrial field. Their ratio of exports to local sales varies significantly, and their competition overseas is different. They also enjoyed different degrees of market protection.

We were able to get robust inflation adjusted results for ROI for all companies studied despite the high inflation rate in Israel. This should make the presented method a valuable tool for management and also for policy analysis. The performance of industry strongly depends on government policies, which are in certain cases outside the companies control, such as nationwide salary settlements and foreign exchange rates. A database allowing to follow the ROI of a representative industrial sample could allow one to study the impact of the government policy on the health of Israeli industry. Our method allows a straight forward computation as to how much the ROI would have been for a change in exchange rate or in a salary. To illustrate this option we give in figure S3 the ROI of IAI for a hypothetical scenario in the eighties. The exchange rate was increased in 1985 to 1990 by 5% and salaries were reduced by 5%. We note that negative periods of ROI disappear and the ROI of IAI becomes respectable. It could, therefore, provide a better basis for labor negotiations.

The fact that our method is able to measure the return on the investment in a reliable way in spite of the inflation and changes in accounting procedures should also be important to management of industrial companies, to the directors of holding companies and to the investment community. The method shows trends that require

actions that are hard to recognize directly in the yearly reports. Thus a strong decrease in the return can be detected much earlier from the estimate of the rate of return on investment compared to the return on equity or the return on capital employment.

In order to rationally discuss the desirability of different government policies to encourage industrial investment, there is a need for an additional quantitative criteria measuring the contribution of industry to the economy. One measurement of the contribution is the gross domestic product (GDP) generated by the company, which was computed for all the companies investigated.

This contribution to the national GDP has to be related to the investment. It was related both to the Active Investment and to the Net Investment. The Active Investment in a certain year is defined as the total cumulative inflation adjusted investment over N years prior to that year. N is chosen as the typical lifetime of new capital equipment for that specific industry. We chose it equal to the lifetime normally assumed in forward analysis.

The Net-Investment is a new concept developed in this report. It is defined as the difference between the total cumulative investment of the company and the cumulative reinvested cashflow. In mature large American companies this difference is small as most of the growth was self financed. The ability of a company to maintain in the long run its own investments and self finance its growth, is an important contribution of an industry to the local economy. If the net investment is in the form of debt (bonds or loans) the low Net-Investment relative to the total investment minimizes the exposure of the company to market fluctuations.

Most of the investigated Israeli companies were either relatively young or had a much faster growth than their return on investment allowed. Therefore, their net investment is a larger fraction of the total investment as compared to large successful companies in the U.S. However, in Israel, in the companies investigated, a large fraction of the net investment came from government subsidies which reduced their exposure to market fluctuations. As a matter of fact, the net investment in Israel is

an upper bound for the total cost of investment subsidies. To monitor these subsidies, it is important that annual reports in public companies clearly reflect these subsidies.

While the growth of the companies investigated was larger than their rate of return permitted, they reinvested most of the available cash flow for growth and the ratio of Dividends/Cashflow was low. We suggest that maintaining this ratio low should be an important consideration in future plans for privatization of government companies and should be encouraged by tax policies. To illustrate the concept, the Net-Investments and the Active-Investments for the three Israeli companies are shown in figure S4. Detailed data are given and discussed in the report.

One measure that summarizes the historic impact of these companies to the Israeli economy is the ratio of cumulative GDP to total net investment. It is given Table S4. It gives the total contribution to the economy obtained till now for each dollar of net investment. Since the Net Investment gives the upper bound on the total government subsidies for the investment, the ratios in Table S4 give a lower bound for the return to the economy in terms of GDP for each dollar of government subsidy. It is shown in the report, that this ratio is also a lower bound for the total increase in tax revenue caused by the economic stimulation due to the increased GDP per dollar of subsidy.

For all companies studied, this ratio (Table S-4) was above ten, an impressive achievement. Furthermore, differences between high investment companies such as the Dead Sea Works and low investment companies such as Electronics are less than expected, partially due to the fact that the investment activities due to reinvested cashflow also contribute to the GDP.

Our results refer only to the companies studied and cannot be extrapolated to all the Israeli industry. However, the companies investigated produced 20% of the industrial GDP in Israel and therefore, the results should be useful to understand trends in Israel industry.

The method presented can be used to obtain similar results for

industrial sectors. Such a database continuously updated, could be useful for policy decisions and for continuously monitoring the impact of these decisions on industry. To ensure growth of a healthy industry it is important that the Government creates conditions which permit a healthy return to the investment, and encourage reinvestment of the profits.

The methodology should be useful in obtaining data relevant to present policy discussion regarding the formulation of an industrial policy in Israel. Should the government involvement be limited to the development of an infrastructure or should it subsidize development and growth of industrial companies? Here, the concepts of Net Investment relative to subsidies and the ratio of yearly and cumulative GDP to net investment allows a judgment as to how successful previous policies of direct subsidies for investments were. For the companies investigated, the policy was very successful and it is doubtful that they would have grown at the same rate, with no Government intervention. It is however possible that other, less direct encouragement, might have had similar or better results. The data here are insufficient for a final conclusion. Specifically missing are government investment in companies that failed.

The concept of Net Investment is also important when considering privatization of successful government companies. It is important that the privatization should be done raising equity capital. If the buyer has to borrow a large fraction of the capital, the reduction of the available cashflow will reduce the opportunities for future growth.

We hope that further research by these methods will contribute to this important discussion and lead to more effective government policies for promoting a larger healthy industrial basis for the Israeli economy.

Table S1: AVERAGE RETURN ON INVESTMENT OF SELECTED USA COMPANIES

	1955-64	1965-74	1975-84
Exxon	8.7	7.7	5.8
Mobil	6.2	7.7	7.5
Shell	7.7	5.1	4.7
Texaco	9.0	7.9	3.4
NCR	13.4	7.6	6.4
IBM	14.3	13.8	6.5
Boeing	15.9	7.6	8.4
Kodak	16.7	17.1	8.3
3M	21.9	17.5	9.2
Corning	17.2	11.9	4.1
GM	13.8	10.3	6.1
Ford	17.2	9.7	2.6
Int. Paper	12.0	6.6	5.1
Merck	20.1	25.2	12.2
Goodyear	7.3	6.8	3.1
Bethlehem Steel	7.5	3.4	-7.8

Table S2: RETURN ON INVESTMENT OF SEVEN ISRAELI COMPANIES

IN PERCENTS, LAST FIVE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	0.3	–	1	–	27	–	8
1975	6	7	6	–	43	33	13
1980	12	8	11	25	25	8	15
1985	7	1.9	8	16	16	10	14
1990	-3	-1	6	6	19	7	-5
89/90	-4	3	8	20	16	10	-5

Table S3: RETURN ON EQUITY

IN PERCENTS, LAST FIVE YEARS AVERAGE

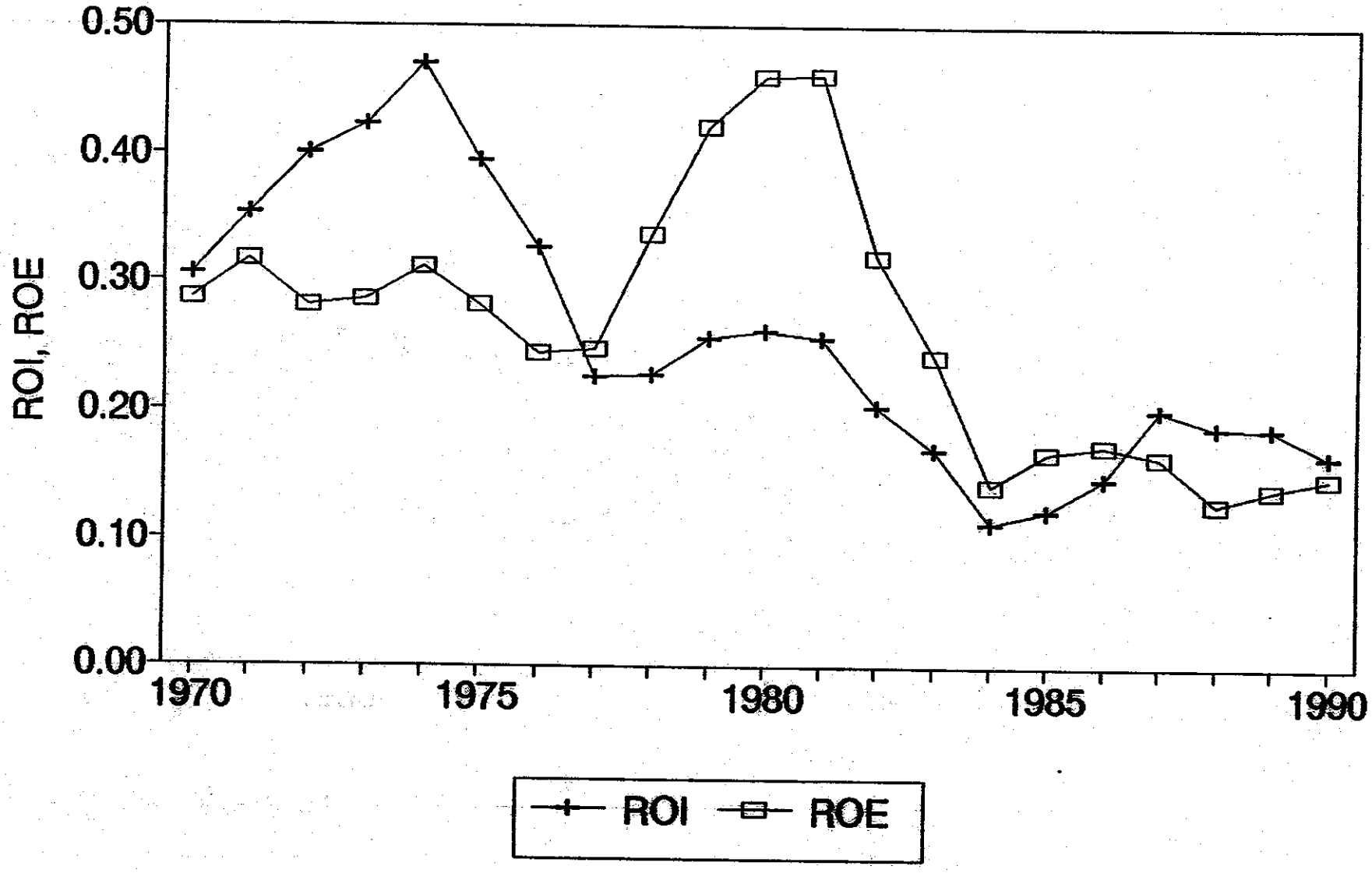
COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	13	7	-6	-	25	-	1
1975	19	16	22	14	30	21	27
1980	35	38	54	10	34	8	49
1985	8	35	35	8	26	22	46
1990	-3	-11	14	4	16	13	-21

Table S4: CUMULATIVE GDP / NET INVESTMENTS

RATIO, THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	–	–	1.0	–	–	–	–
1975	2.1	4.8	2.9	3.4	6.4	5.3	4.6
1980	6.6	9.9	5.1	8.8	32	4.9	9.0
1985	9.7	13.1	8.4	6.4	81	12.7	15.0
1990	10.6	15.0	12.7	10.0	54	15.7	12.9

Figure S1a: Return On Investment (ROI) and Return On Equity (ROE) (averaged over three years) of Teva Co.



S10

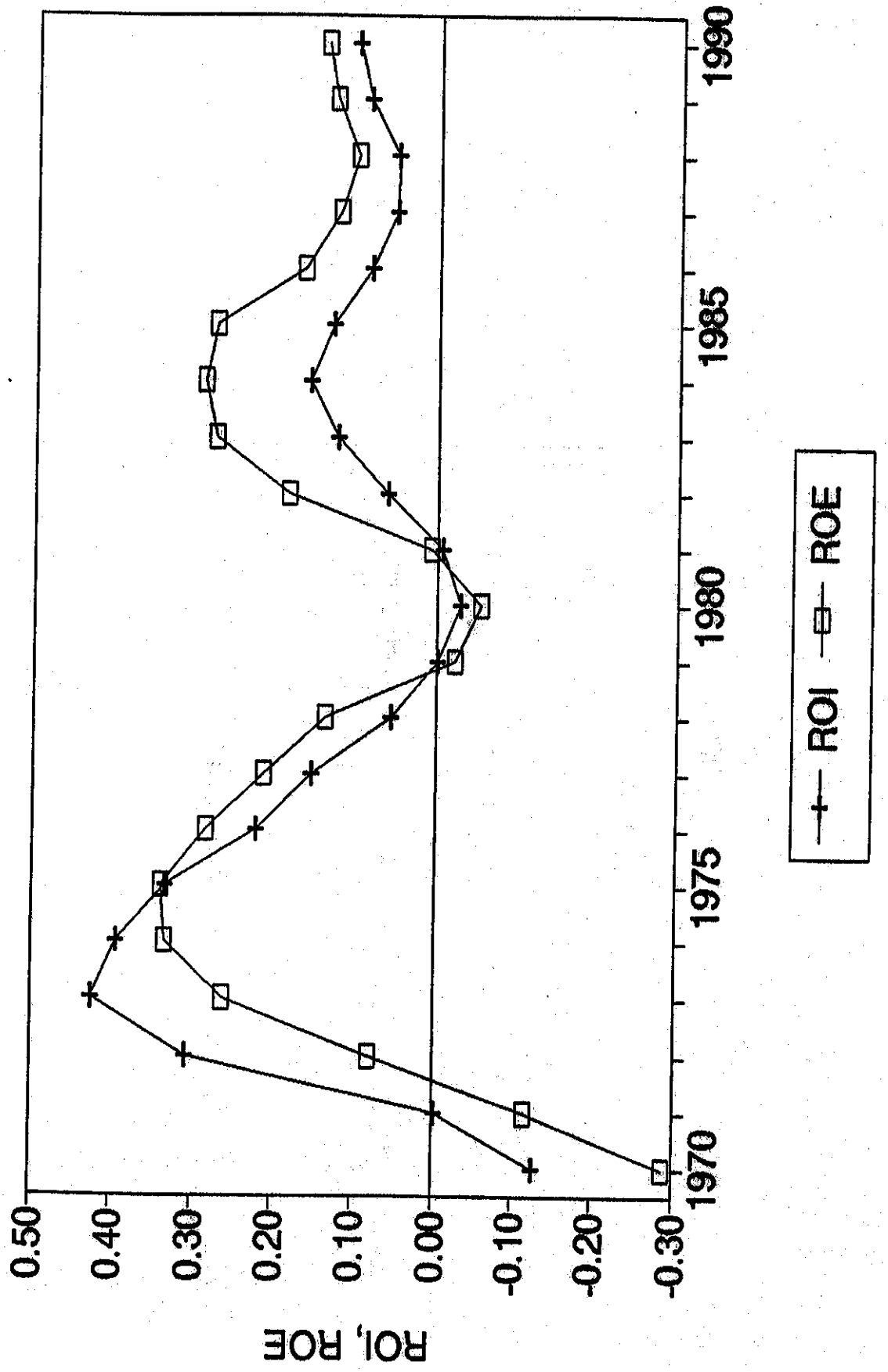


Figure S1b: Return On Investment (ROI) and Return On Equity (ROE) (averaged over three years) of Elbit Co.

Figure S2a: Return On Investment (ROI) (averaged over three years) of Teva Co. compared with Merck

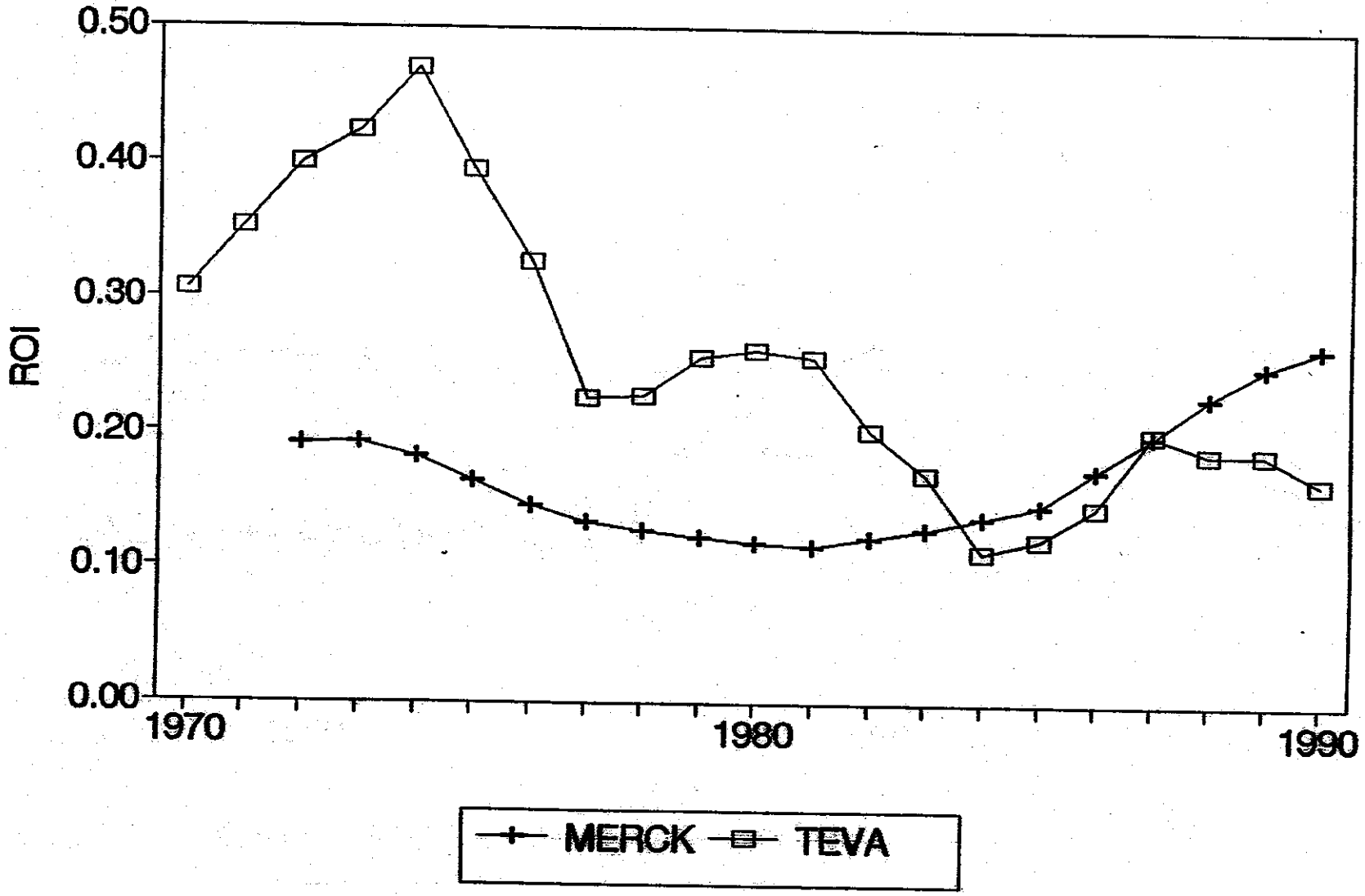


Figure S2b: Return On Investment (ROI) (averaged over three years) of Elbit Co. compared with Intel

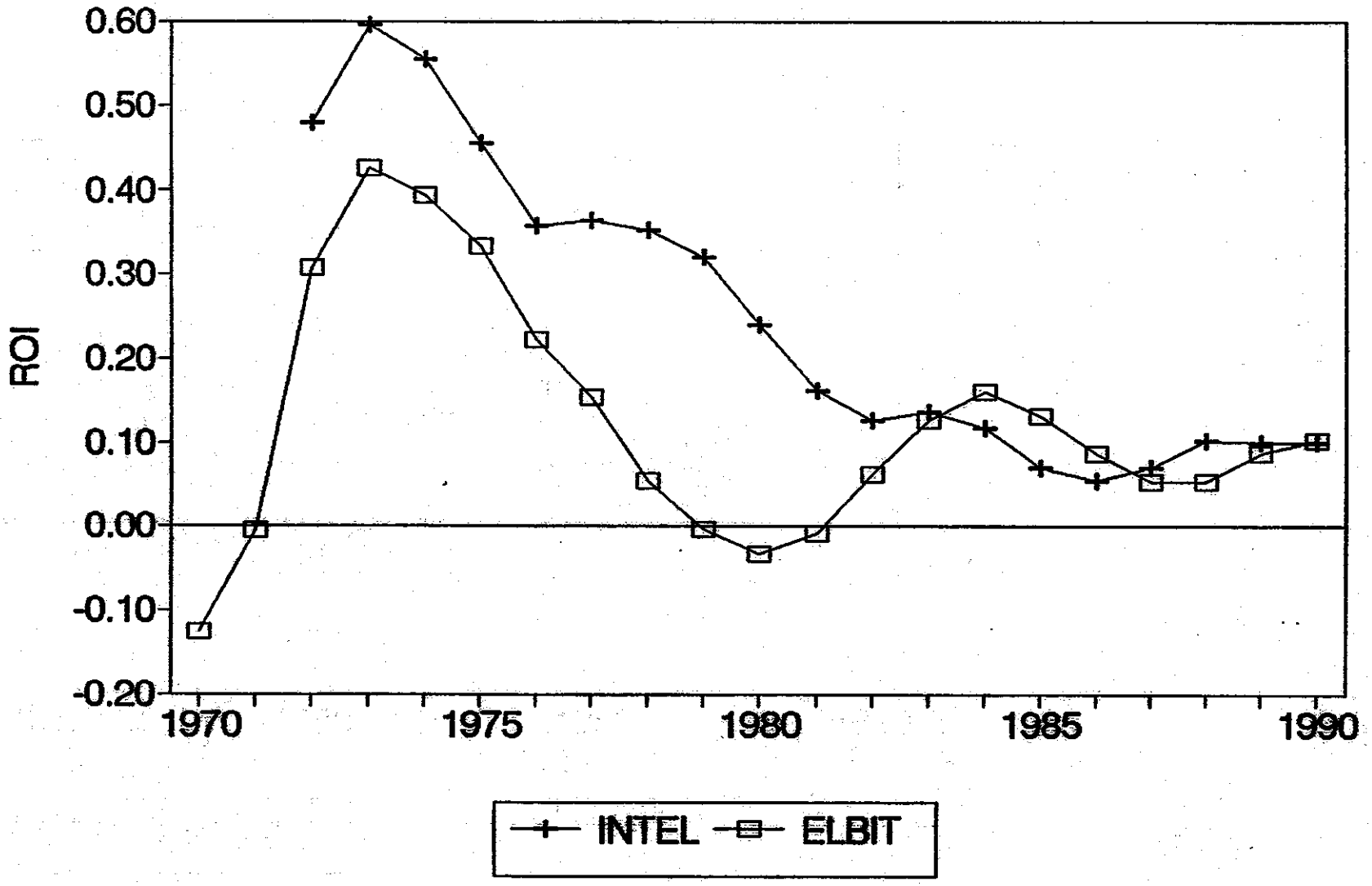


Figure S3: Effect of government policy: Return On Investment (ROI) (averaged over three years) sensitivity to salary and Dollar exchange rates for IAI

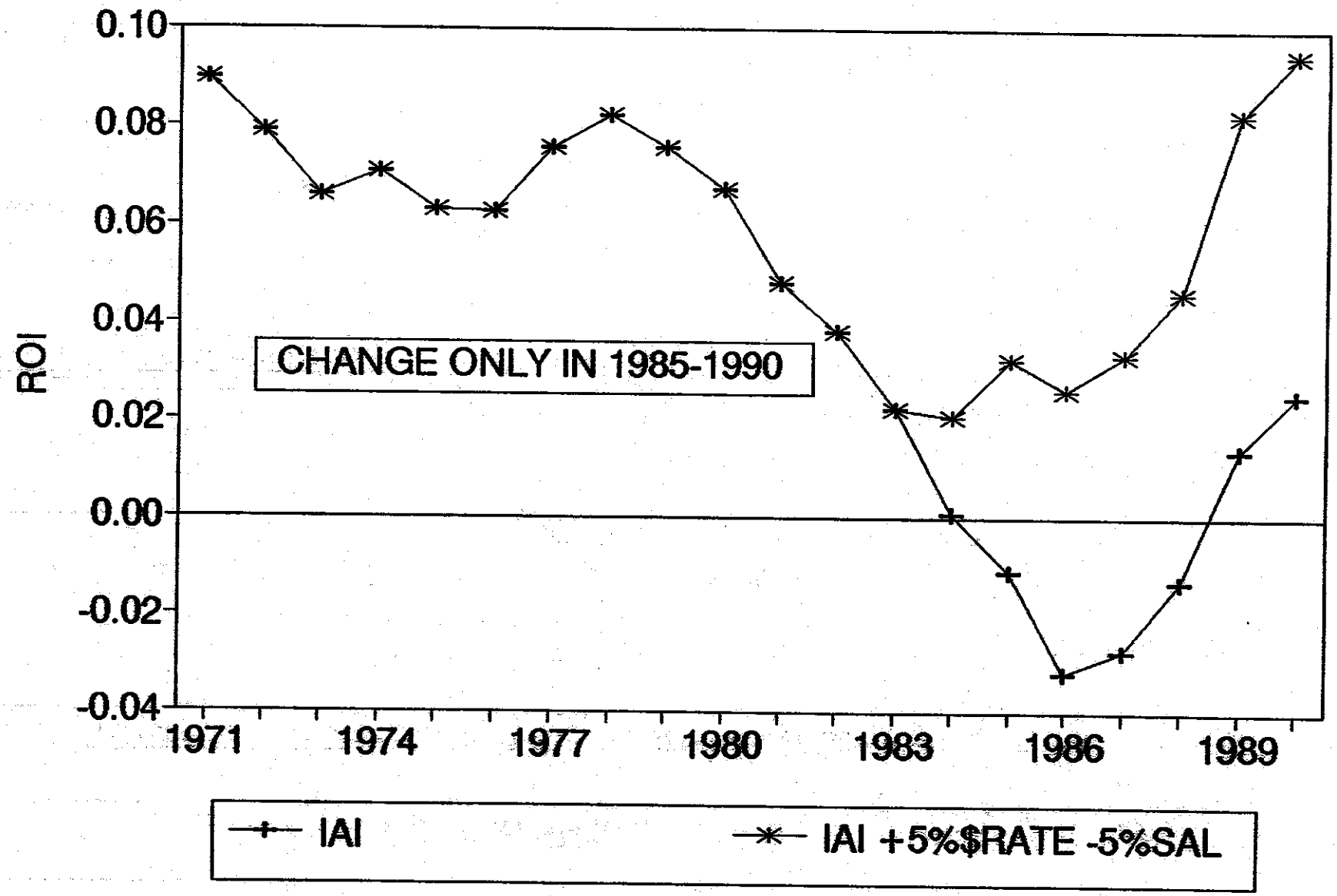


Figure S4a: Net Investment and Active Investment of Elbit

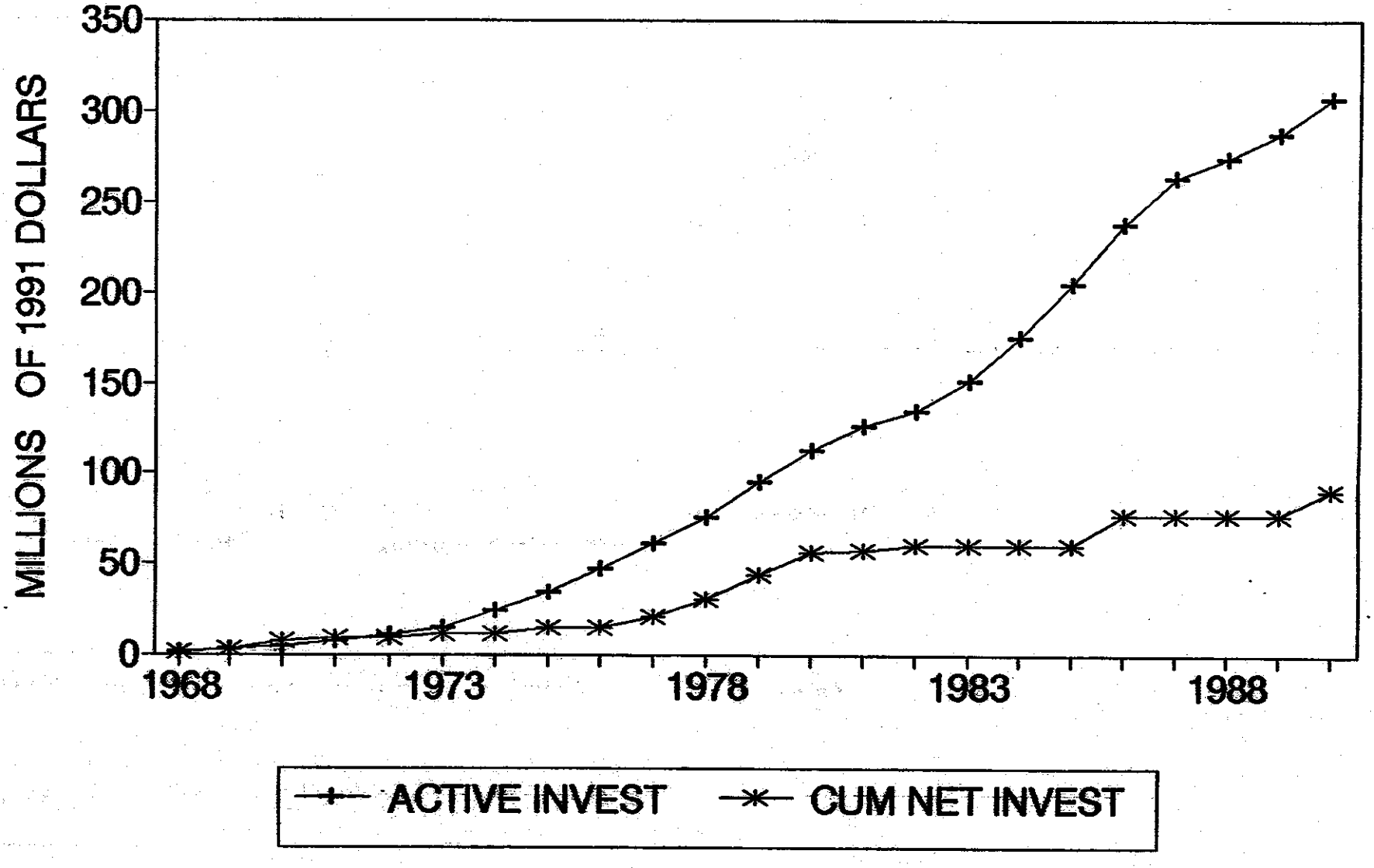


Figure S4b: Net Investment and Active Investment of Teva

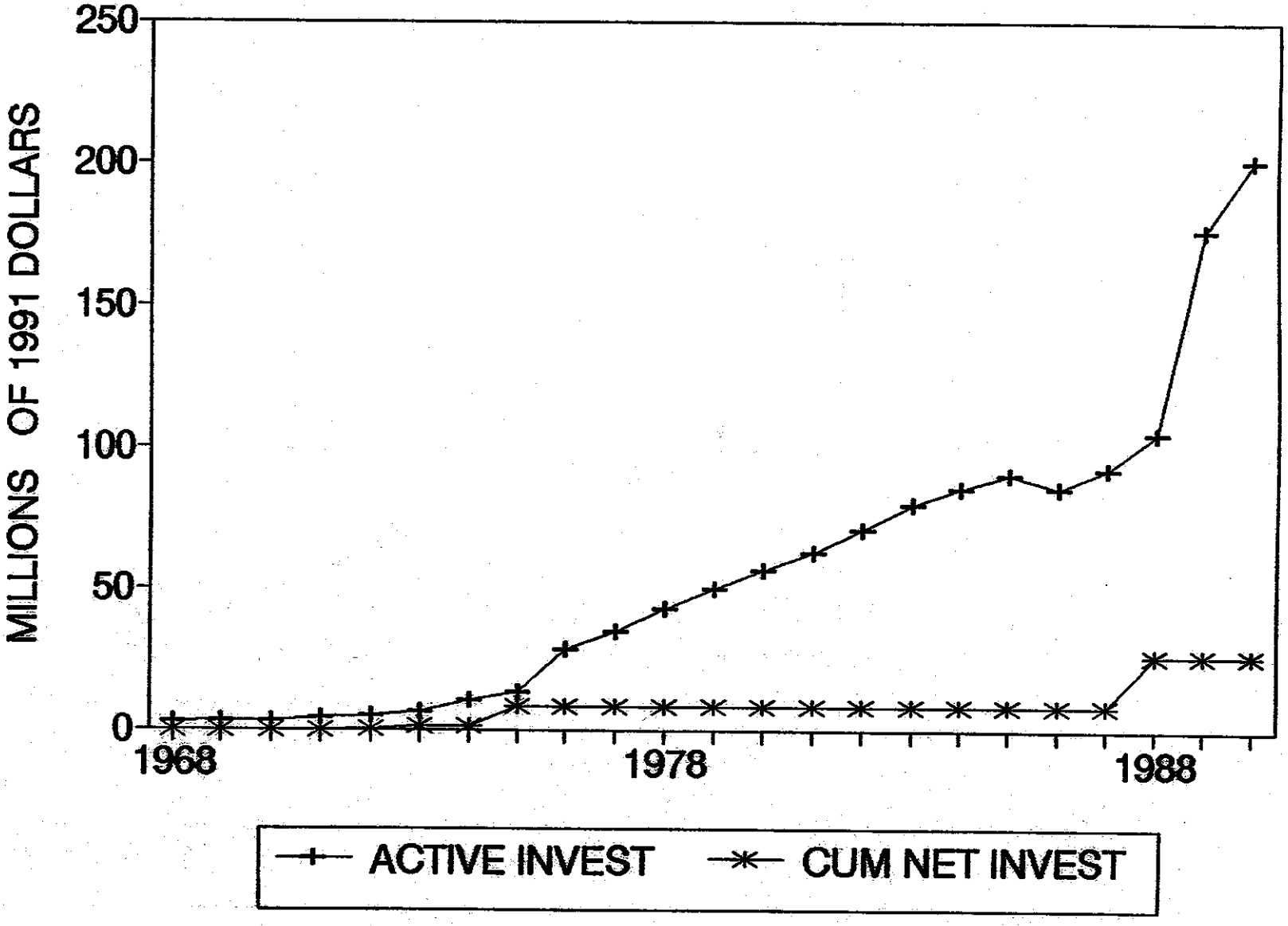
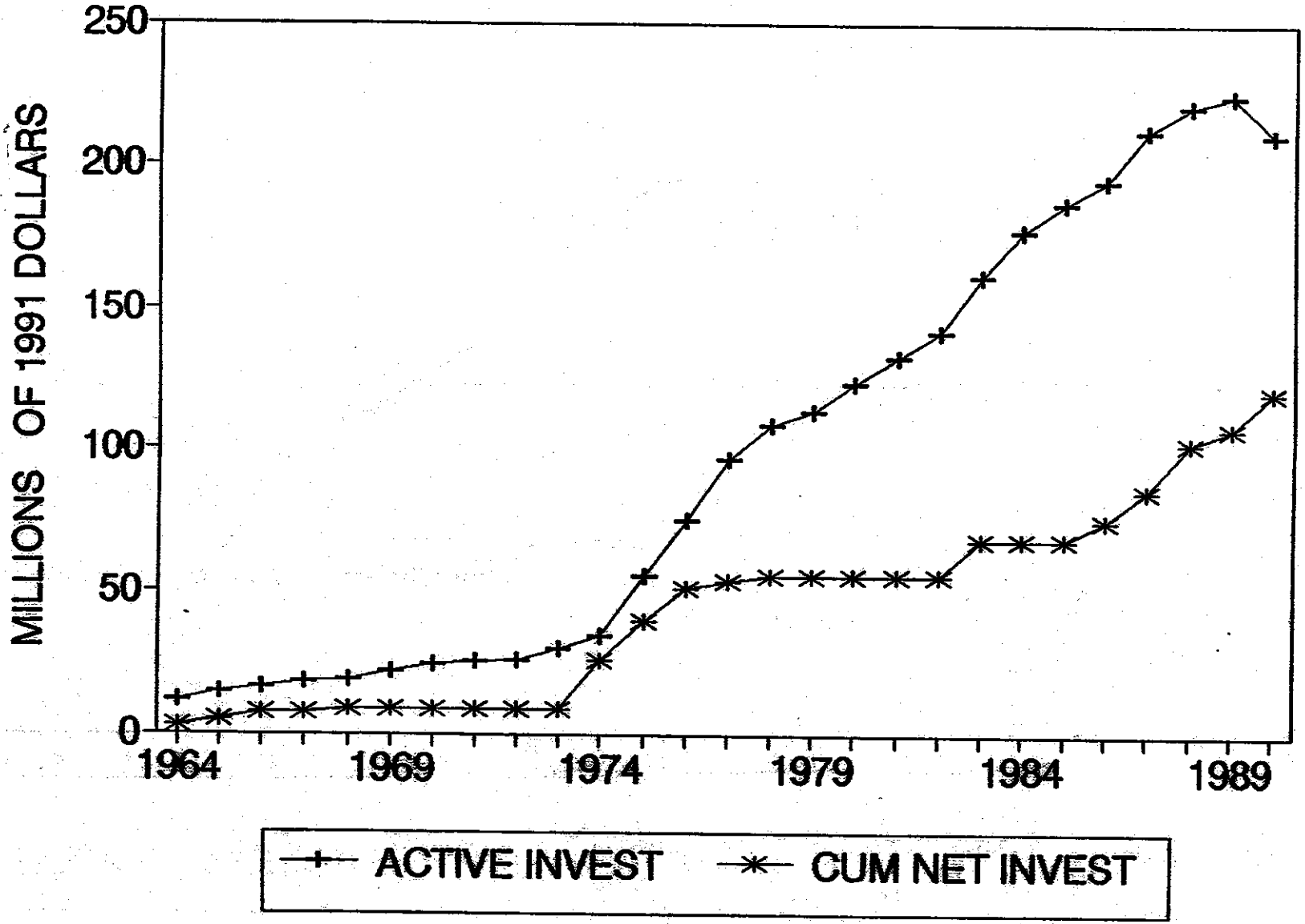


Figure S4c: Net Investment and Active Investment of Polgat



I. INTRODUCTION

If one accepts the need for an industrial policy that encourages industrial investment then it is important not only to define the issues but also to develop well-defined quantitative parameters.

In the following report we will propose several parameters that should be useful for this purpose and give results for a selected group of seven large Israeli companies.

We deal here with two related but distinct issues. The first is measuring an inflation adjusted rate of return on the investment. While this rate is widely used in judging new investments, no data are available in Israel on the actual performance of companies. Professor Shinnar has developed such a method, and has published data for a set of major U.S. companies (ref. 1). The method should be of special interest in Israel. In Israel data on return on equity are almost meaningless. It should be an important tool in following the health of and performance of Israeli industry and the way it is affected by government policies such as national salary settlements, exchange rates, subsidies and other measures.

The second issue we deal with is the contribution of industrial companies to the Israeli economy. We introduce here a new concept, the "net investment" which measures the way a company grows by reinvesting its own cashflow. We also computed data for the contributions of companies to the gross domestic product, and related these data to both the active and the net investments.

This provides an effective way to understand the contribution of government subsidies to the development of those companies.

II. MEASURING ROI, THE HISTORIC ECONOMIC RATE OF RETURN ON INVESTMENT

One criterion of performance for evaluating new industrial investment is the economic rate of return (or the discounted cashflow rate of return (3)) which we call ROI. Another similar criteria is the net present value in which the cashflows are discounted by an a priori assumed rate of return and compared to the initial investment. For an industry to be viable, both the net present value and the ROI have to be positive. They also have to be attractive to the investor compared to other potential investments. A high ROI also allows rapid growth by reinvesting the cashflow.

Until recently there was a lack of reliable data on the economic rate of return of industrial companies. This was due to the difficulty of measuring the economic rate in a company with multiple continuous investments, as pointed out by Fisher and McGowan (2), who also proved that the return on equity (ROE) cannot be used to estimate ROI.

For a new equity investment of I dollars, the economic rate of return of investment, r, is defined as follows. Let C be the net cashflow from operations that is generated by the investment in the year j during the projected life of the investment. The economic rate of return can then be defined as the value of the discount rate such that

$$\sum_{j=1}^{n} \frac{C_j}{(1+r)^j} = I \qquad (1)$$

For single investments, equation (1) is being used extensively to judge new investments. In reference (1), a method was developed that allows one to get an average inflation adjusted estimate of r, the ROI for industrial companies with multiple investment. The method has been thoroughly checked by leading experts, and a detailed exposition is given in ref. 1. In this method the cashflows in equation (1) are exchanged by a capital recovery which consists of the cashflow from operations plus interest on long term debt.

In the investment we include all capital investments as well as research and development expenses; as we count them as an investment we also add them to the cashflow. To compute the ROI, an active investment (AIN) is defined as the sum of all investment n years back, where n is the estimated average life time of all investments typical for that industry. While our estimates depend on the proper choice of n it is not sensitive to it.

This was proven in ref. 1 for a large set of 38 U.S. companies and also applied here. To demonstrate this, we give one typical result for Israel in fig. 1. Our results were also not very sensitive to the way the adjustment for inflation was made. Converting all numbers to constant dollars gave similar results to converting all numbers to constant shekels (fig. 2).

The method was shown to give robust results despite the large

inflation rate in Israel. This could be of great importance for management in monitoring the performance of Israeli industrial companies. Other conventional measures such as return on equity (ROE) are of little use especially when inflation rates are high.

The values of ROI calculated in our approach are reasonably independent of accounting practices such as depreciation and also independent of the way the investments were financed. There are several problems we found in analyzing Israeli companies. One is that annual reports over the total history of the company are hard to come by, even for companies that are public. Many became public only quite recently and therefore early data are unavailable. In general, there is no easy way to get old data even in public companies. In the U.S., such data are freely available for a large number of companies from the Security Exchange Commission, from Moody and for the last twenty years from computerized databases. It would be very important to make such a database available for Israeli industry, and keep it available in the future.

In fig. 3(a-g) we give the ROI over time for seven Israeli companies, representing major sectors of Israeli industry. On each graph we give the ROI, and the ROE. In Fig. 4(a-e) ROI of several Israeli companies are compared with their equivalents u.s. companies. Additional results for U.S. industries are given in ref. 1 and for the international chemical industry in ref. 4. Some of these data are summarized in Table 1. In ref. 1, we showed that ROE is not a reliable indicator for ROI, a result proven theoretically by Fisher et al. (ref. 2). The reason that ROE does

not reflect the real rate of return is that the two concepts are inconsistent with each other. The rate of return is defined similar to a mortgage where over a finite period the principal has to be returned while paying interest over the remainder during the whole period. If the payment per year is constant, the payment in the early years will be mainly interest and the fraction of the payment dedicated to repayment of principal will increase over the years. In the computation of ROE, the value of the investment is depreciated in the early years despite the fact that the remainder is insufficient to pay the return required. For a single investment, with linear depreciation, ROE increases over the life of the investment. If the period of depreciation is shorter than the project life, ROE becomes infinity.

ROE therefore strongly depends on the method of depreciation, even if there is no inflation. Updating the nondepreciated capital each year according to inflation (as done in Israel since 1983), will take care of the inflation problem, but not of the basic problem.

Theoretically, ROE could be equal to ROI in an ideal growth company with constant behavior, in which all the cashflow is reinvested with constant results, and in the absence of inflation.

ROE is also strongly affected by discretionary actions of management, permissible by accounting regulations, that have no impact on the real return such as write-off, changes in depreciation, etc. Our method of computing ROI is insensitive to this problem.

For many of the U.S. companies the relation was quite reasonable, but for some, such as IBM the difference was large and the trends were in the opposite direction (see fig. 5). We discussed this with the Treasury Department of IBM, who checked our method and found that our results were in good agreement with the real trend. The recent history of IBM also confirmed this. In most of the Israeli companies there is a much larger difference between ROE and ROI, due to accelerated depreciation and due to past difficulties to adjust ROE for inflation (Fig. 3).

The data in figure 4 are interesting and speak for themselves. They do not represent Israeli industry but the above sample reports close to 20% of the total industrial output. What is interesting is that for a number of companies the results are quite impressive and close to their U.S. comparison. Swings are larger but what is worrisome is the decline in the eighties where there was an upturn in the U.S. However, we have to point out that while ROI is a reliable indicator for trends, any method based solely on published annual reports does not allow analyzing in detail the underlying reasons.

What the method allows is to look at the impact of different outside factors. To illustrate this option we give in figure 6 the ROI of IAI for a hypothetical scenario in the eighties. The exchange rate was increased in 1985 to 1990 by 5% and salaries were reduced by 5%. We note that negative periods of ROI disappear and the ROI of IAI becomes respectable, especially if we remember that it is in constant dollars. A 10% increase in the exchange rate at

constant salaries would have had a similar impact. We do not want to enter the discussion which of these two alternatives is preferable but both affect the ROI and both are outside the direct control of most of the individual companies. It might be, therefore, desirable to get a database for measuring ROI and follow a selected sample of companies to detect trends and establish base values. These data could then form a basis for a more rational policy discussion. Such a database would also allow a comparison, as to the impact of exchange rates on export oriented industries compared to industries dedicated mainly to the local market.

For direct comparison we give the data for ROI and ROE in Tables 2 and 3. Due to the strong changes, the graphs are here more illuminating. To put the development of those companies and the trend in proper perspective we give in Tables 4-8 relevant data for the growth and overall behavior of the companies. Table 4 gives the total sales; Table 5 the active investment; Table 6 the total historical investment; Table 7 the cumulative research expenditures; Table 8 the capital recovery; Table 8a the cashflow; Table 9 the ratio of long term interest to capital recovery; Table 10 the ratio of dividends to cashflow. All numbers are in constant 1991 dollars adjusted to the U.S. CPI. We note that on an inflation-free basis, most companies showed a very healthy growth in sales over the whole period. The main exception being Koor who had only a 10% growth in sales during the '80s, despite a very large growth in the active investment, which indicates that a large fraction of these investments were ineffective. On the other hand,

Koor, due to its complexity and past ownership of many companies, is hard to analyze. The large increase in investment despite the small increase in sales might be the explanation of the sharp decrease of ROI of Koor in the eighties, which only starts to reverse in the last year. The ratio of long term interest over capital recovery is relatively large for several of the companies as can be seen from Table 11, where we give a similar ratio for one year for some U.S. corporations. On the other hand, the dividend over cashflow ratio is low for all companies, indicating that all the companies reinvested most of their cashflow.

III. CONTRIBUTION TO THE ECONOMY AND THE CONCEPT OF NET INVESTMENT

In order to rationally discuss the desirability of different government policies to encourage industrial investment, there is a need for an additional quantitative criteria for choosing between different projects and for performance measurements of such policies. One important contribution to the economy is the gross domestic product (GDP) generated by the company, which was computed for all the companies investigated (Table 12). For an example, see Figure 7.

This contribution to the national GDP has to be related to the investment. One common way in estimating the potential contribution of a project to the GDP is to relate the yearly GDP to the size of the investment and estimate the total contribution to the GDP over the lifetime of the investment per dollar invested. This multiplying factor is given in Table 13, and is computed by

dividing the GDP per year by the active investment normalized by the lifetime. We also compare it in Table 14 with the results of some American companies. We again point out that the active investment here is inflation adjusted.

Relying on this ratio is an incomplete measure, which can be misleading. Industrial development is not based on single projects. Healthy companies often have multiple projects and grow to a large part by reinvesting their profits. We became aware of this, studying the companies analyzed in ref. 1. Almost all of the 38 companies, which are the largest in their fields, grew by reinvesting their profits. Outside sources of financing were important in the beginning but made minor contribution during the main period of growth. This can be seen in Table 15, where we give for the year 1975 the sum of all capital investment since the year data became available in comparison to the total cashflow. We also give the total dividends and the long term debts. U.S. companies grew in the period between 1940 and 1975 by reinvesting their cashflow and borrowing part of their dividends. This table is the only table we give in current dollars, as debt in the U.S is not inflation adjusted. Successful industrial companies are living organisms, and one has to judge therefore their contribution by looking at the development of the company.

In the U.S., the return to the investor was mostly in the long term growth and very little in direct dividends. The ability of a company to maintain in the long run its own investments and self finance its growth, is an important contribution of an industry to

the local economy. A low Net-Investment relative to the Total-Investment leads to low debts and minimizes the exposure of the company to market fluctuations.

The Net Investment is a new concept, developed in this report. It is defined as the difference between the total cumulative investment of the company and the cumulative reinvested cashflow. In order to relate it to GDP, we compute the Net Investment, inflation adjusted, by adjusting all investments to constant dollars (1991), and also by converting all cashflow to constant dollars. The reinvested cashflow is computed by taking the cashflow from operations and subtracting from it all dividends. If (cashflow-dividends) are larger than the capital investment, than we follow its use in the future. If it is reinvested, we deduct it from the capital investment. Research and development expenditures, while appearing in the total investment, do not have to be taken into account, as they were deducted from sales before the cashflow was computed. The results are given in Table 16.

Table 17 gives the ratio of the Net Investment to total cumulative investment for the companies studied and Table 17a gives some U.S. companies in comparison. To illustrate the concept, the Net-Investments and the Active-Investments for three Israeli companies are shown in figure 8. In mature large American companies, this difference is small as most of the growth was self financed. Most of the investigated Israeli companies are either relatively young or had a much faster growth than their return on investment allowed. The fraction of Net Investment to total

investment is therefore larger. However, younger American companies such as Intel or even Ethyl, have similar ratios.

To better understand the necessity of the concept of Net Investment for policy considerations, let us look at the Dead Sea Works in table 16 and 17. This is an example of a successful company that was started by the Government. Over the years, the company grew both in sales and in the active investment. Most of the needed capital for the growth came from internal funds. The ratio of Net Investment to total investment decreased continuously. If we want to look at the contribution of the company to the economy, this self-financed growth must be included in the contribution. It makes therefore sense to relate the yearly contribution to GDP to the Net Investment. Here, the Net Investment represents the investment of the Government in the company, either in the form of direct capital funds, or in loans. This is an especially important consideration for a chemical company (in which 65% of the investment are local expenses and for which the cashflow is a large fraction of the contribution to the GDP). The concept itself is important for all companies, as well.

We do not want to imply that the Net Investment or the fraction of Net Investment to total investment should serve as a comparison between companies. No parameter can be used this way in isolation. The fraction of the total investment that comes from ~~investment~~ cash flow depends on the age of the company, on the ROI obtained, and the fraction of profits invested. It also strongly depends on the rate of growth, as the growth rate due to reinvestment of the

cashflow is limited, to the value of the ROI. In fact, this is the physical meaning of ROI introduced by Solomon (Ref. 2). However, these limitations do not detract from the value of the concept of net investment to understand the long term impact of industrial growth on the economy.

Creating overall economic conditions that promote a reasonably high ROI should therefore be an important policy consideration, especially if it is accompanied by laws that encourage reinvestment of the profit.

The Dead Sea Works had a high ROI over a substantial period which allowed growth by reinvestment. Sometimes a much higher growth rate is justified and desirable which would increase the net investment.

All the investigated companies reinvested most of the available cash flow for growth and the ratio of dividends/cashflow was low. We suggest, that maintaining this ratio low should be an important consideration in future plans for privatization of government companies and should be encouraged by tax policies.

There are two ways in which we can relate the GDP to the cumulative net investment, which in short we called Net Investment. One is the ratio of the yearly GDP to the Net Investment. We give it in Table 18 and for three companies plot the development of this ratio over the years in figure 9. The other is the ratio of the cumulative GDP contributed by the company (in constant dollars) to the net investment. It is given in Table 19. Both ratios should grow over time though the change is slow during rapid growth. The

history of how the plot of cumulative GDP to Net Investment develops over time is given for the companies in figure 10.

The ratio of cumulative GDP to Net Investment has another interesting property. The Net Investment is an upper bound for the sum of investment and research grants obtained by a company. Therefore, the ratio is a lower bound for the multiplying factor by which investment grants stimulated the economy. It is also a lower bound for the return to the Government in the form of taxes from each dollar given as an investment grant. This conclusion is based on the following argument. Each dollar of GDP entering the local economy from industry creates a stimulation measured by a multiplying factor which most people estimate to be larger than three. Even if it is only 2.5, and overall taxes are only 40%, the results would be that each dollar of GDP created by an industrial company results in one dollar of taxes. This assumes that the investment could not have happened in the absence of the subsidy, but still it is a useful estimate to discuss the return in the form of taxes for investment subsidies. For all companies this return was rather high (grater than 10).

Obviously, this is only true for the companies studied and cannot be extrapolated to industry in general. Others may have failed and produced no return, but the method could serve as a basis for an overall estimate.

There are several interesting features to Tables 16 - 19. One is the fact that the differences between industries is less than one normally assumes. This is especially true for the Dead Sea

Works which represent a heavy chemical industry which uses Israel's natural resources. Its contribution compares well with labor intensive industries especially when we base it on the net investment. The Dead Sea Works increased their sales and their contribution to the GDP by 80% from 1980 to 1990 and their active investment by 30% without any increase in Net Investment. All companies in the sample have made a cumulative contribution to the GDP at least ten times larger than their Net Investment. As the Net Investment is larger than their total government investment subsidies, this also reflects a healthy return on these subsidies, both in terms of money and taxes. Again, we emphasize that this refers to our sample only. We did not have the resources to perform a study which statistically reflects Israeli industry. Our goal was to develop a methodology and present results that demonstrate its applicability.

References

1. Shinnar, R. "Estimation of the Economic Rate of Return for Industrial Companies." The Journal of Business, University of Chicago. 62, p. 417 (1989).

2. Solomon, E., ed. 1959. "The Management of Corporate Capital." University of Chicago.

3. Fisher, F.M. and McGowan, J., 1983. "On the misuse of accounting rates of return to infer monopoly prices." American Economic Review. 73, p. 82. 1983.

4. Shinnar, R. and Avivluin, A. "The Chemical Industry Past and Future Performance." Chemical Engineering Progress, p. 56. July 1988.

Tc 14

Table 1. Average return on investment of selected companies.

	1955-64	1965-74	1975-84
Exxon	8.7	7.7	5.8
Mobil	6.2	7.7	7.5
Shell	7.7	5.1	4.7
Texaco	9.0	7.9	3.4
NCR	13.4	7.6	6.4
IBM	14.3	13.8	6.5
Boeing	15.9	7.6	8.4
Kodak	16.7	17.1	8.3
3M	21.9	17.5	9.2
Corning	17.2	11.9	4.1
GM	13.8	10.3	6.1
Ford	17.2	9.7	2.6
Int. Paper	12.0	6.6	5.1
Merck	20.1	25.2	12.2
Goodyear	7.3	6.8	3.1
Bethlehem Steel	7.5	3.4	-7.8

Table 2: RETURN ON INVESTMENT OF SEVEN ISRAELI COMPANIES

IN PERCENTS, LAST FIVE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	0.3	–	1	–	27	–	8
1975	6	7	6	–	43	33	13
1980	12	8	11	25	25	8	15
1985	7	1.9	8	16	16	10	14
1990	–3	–1	6	6	19	7	–5
89/90	–4	3	8	20	16	10	–5

Table 3: RETURN ON EQUITY

IN PERCENTS, LAST FIVE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	13	7	-6	-	25	-	1
1975	19	16	22	14	30	21	27
1980	35	38	54	10	34	8	49
1985	8	35	35	8	26	22	46
1990	-3	-11	14	4	16	13	-21

Ic 16

Table 4: SALES

CONSTANT 1991 MILLION DOLLARS

THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	326	188	119	–	14	7	28
1975	847	528	259	14	41	50	43
1980	2550	1073	328	29	86	84	135
1985	2614	1175	409	134	115	189	163
1990	2822	1368	591	283	282	252	183

Table 5: ACTIVE INVESTMENT

CONSTANT 1991 MILLION DOLLARS

THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	774	109	654	-	3	3	22
1975	919	429	681	1	10	24	40
1980	1767	879	936	15	50	95	115
1985	2890	1461	1122	99	85	178	175
1990	3850	1720	1235	270	161	290	219
N YEARS	15	15	20	10	10	10	15

Table 6: CUMULATIVE TOTAL INVESTIMENTS

CONSTANT 1991 MILLION DOLLARS

THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	1422	203	690	–	2	5	24
1975	1927	493	808	2	17	35	55
1980	3200	1039	1211	22	58	116	137
1985	4756	1716	1636	143	105	241	210
1990	6000	2239	1955	332	261	439	267

Table 7: CUMULATIVE R&D EXPENDITURE

CONSTANT 1991 MILLION DOLLARS

THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	3	–	–	–	1	2	–
1975	52	79	–	2	6	21	–
1980	299	367	10	20	18	66	–
1985	702	699	33	89	40	138	–
1990	1133	958	65	200	100	282	–

Table 8: CAPITAL RECOVERY

CONSTANT 1991 MILLION DOLLARS

THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	18	32	30	-	2	0.1	5
1975	119	54	80	2	7	10	7
1980	303	116	127	5	18	9	24
1985	290	95	95	27	17	46	26
1990	121	127	138	84	48	55	-1

Table 9: LONG TERM INTEREST / CAPITAL RECOVERY

IN PERCENTS, THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	45	23	44	–	13	1	36
1975	38	21	4	1	10	3	16
1980	16	7	12	4	17	10	9
1985	24	8	8	6	7	5	59
1990	58	22	14	4	11	5	–

Table 10: CASH DIVIDENDS / CASH FLOW

IN PERCENTS, THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	–	–	–	–	30	–	–
1975	1	0	20	40	24	10	17
1980	2	0	17	1	10	24	11
1985	3	12	14	0	9	0	2
1990	–	0	33	7	13	11	0

Table 11: LONG TERM INTEREST / CAPITAL RECOVERY FOR DIFFERENT USA COMPANIES (1990)

COMP.	MERCK	LOCK-HEED	DOW	ETHYL	EXXON	P.V.H
L.T. INT. / CAPT. REC.	2.8%	10%	10%	13%	13%	37%
SECTOR	PHARM.	AEROSP.	CHEMIC.	CHEMIC.	OIL	APPAREL

Table 12: DIRECT CONTRIBUTION TO GDP

CONSTANT 1991 MILLION DOLLARS

THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	–	–	87	–	–	–	15
1975	355	370	191	9	28	17	21
1980	1593	781	243	18	50	42	77
1985	1552	787	307	88	84	117	96
1990	1653	800	443	216	178	148	93

Table 13: GDP / ACTIVE INVESTMENT PER YEAR

RATIO, THREE YEARS AVERA

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	–	–	2.7	–	–	–	–
1975	5.8	12.9	5.6	72	27	10.3	7.8
1980	13.5	13.3	5.2	12	10.1	4.4	10.0
1985	8.0	8.1	5.5	9	9.8	6.6	8.2
1990	6.4	7.0	7.2	8	11.1	5.1	6.4

Table 14: GDP CONTRIBUTION / ACT. INVEST. PER YEAR (USA COMPANIES)

RATIO, THREE YEARS AVERAGE

COMPANY / YEAR	ETHYL	MERCK	LOCK HEED
1970	–	–	–
1975	13.5	8.4	14.2
1980	7.8	6.2	11.7
1985	4.4	5.4	14.9
1990	4.4	8.4	7.6
SECTOR	CHEM.	PHARM.	AEROS.

Table 15: CAPITAL INVESTMENT & CASH DIVIDEND FOR USA COMPANIES (CURRENT BILIONS $)

Company	Starting Year	CUM Cash Flow Until 1975	CUM Investment Until 1975	CUM DIV Until 1975	LT Debt
EXXON	1931	52.0	46.3	17.9	7.6
MOBIL	1935	19.0	18.9	4.4	2.2
IBM	1937	38.4	32.7	6.5	0
DOW	1935	9.0	8.1	1.4	2.0
MERCK	1955	2.9	1.8	1.1	0.2
BOEING	1942	2.5	1.9	0.3	0.14
CORNING	1942	1.4	1.0	0.4	0.17
GE	1935	14.7	8.2	5.7	1.04
FORD	1942	24.7	18.2	5.0	1.54
BETHLEHEM	1935	8.6	7.4	2.2	0.9

Table 16: CUMULATIVE NET INVESTMENTS

CONSTANT 1991 MILLION DOLLARS

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	464	154	443	–	–	4	8
1975	707	294	452	2	4	12	25
1980	1236	453	465	8	9	44	56
1985	1557	613	465	36	9	60	68
1990	2340	855	465	133	27	81	110

Table 17: NET INVESTMENT / CUMULATIVE INVESTMENT

IN PERCENTS, THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	33	76	64	–	–	85	33
1975	37	60	56	75	22	34	46
1980	39	44	38	38	15	38	41
1985	33	36	28	25	8	25	32
1990	39	38	24	40	10	18	41

Table 18: GDP CONTRIBUTION / NET INVESTMENTS

RATIO, THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	–	–	0.20	–	–	–	–
1975	0.50	1.26	0.42	4.70	7.37	2.00	0.84
1980	1.29	1.72	0.52	2.20	5.80	0.95	1.38
1985	1.00	1.28	0.66	2.40	9.7	1.95	1.41
1990	0.71	0.94	0.95	1.60	6.6	1.82	0.85

Table 19: CUMULATIVE GDP / NET INVESTMENTS RATIO, THREE YEARS AVERAGE

COMPANY / YEAR	KOOR	IAI	DEAD SEA	SCITEX	TEVA	ELBIT	POLGAT
1970	–	–	1.0	–	–	–	–
1975	2.1	4.8	2.9	3.4	6.4	5.3	4.6
1980	6.6	9.9	5.1	8.8	32	4.9	9.0
1985	9.7	13.1	8.4	6.4	81	12.7	15.0
1990	10.6	15.0	12.7	10.0	54	15.7	12.9

Figure 1: Return On Investment (ROI) sensitivity to the assumption of the investments life time (TEVA Co.)

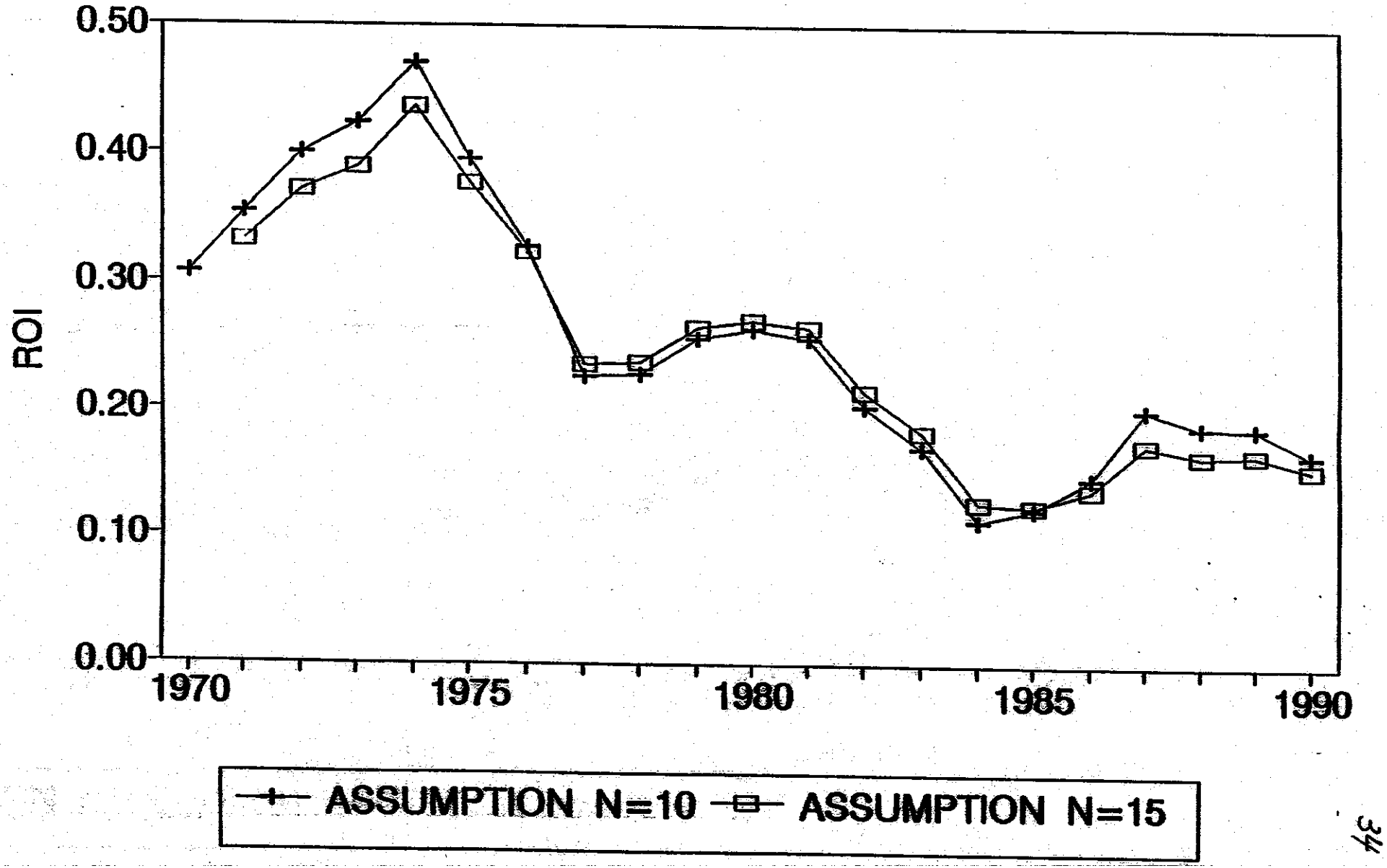


Figure 2: Return On Investment (ROI) sensitivity to the inflation adjustment method,Israeli CPI compared with USA Dollar and CPI (TEVA Co.)

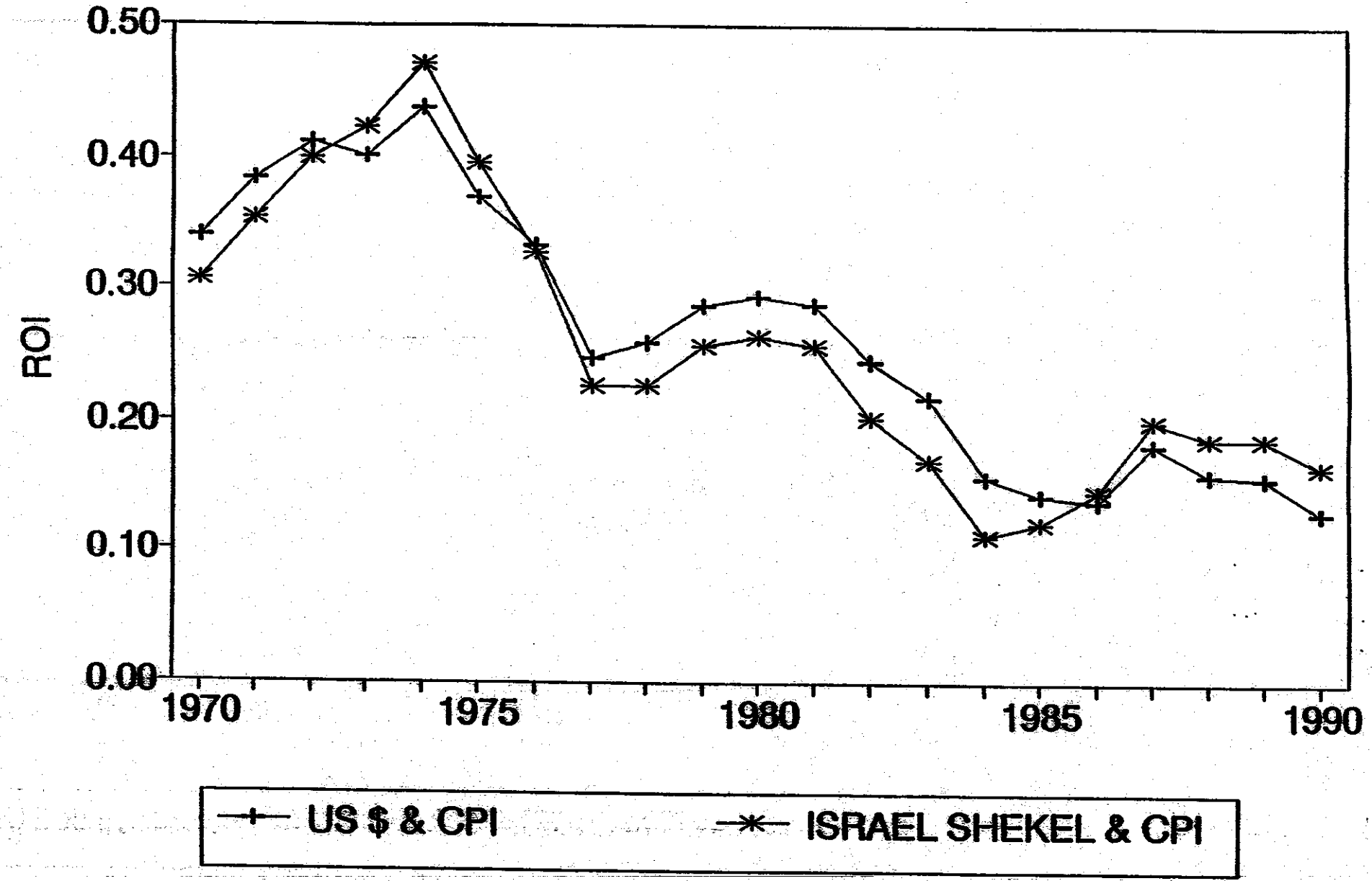


Figure 3a: Return On Investment (ROI) and Return On Equity (ROE) (averaged over three years) of Koor Co.

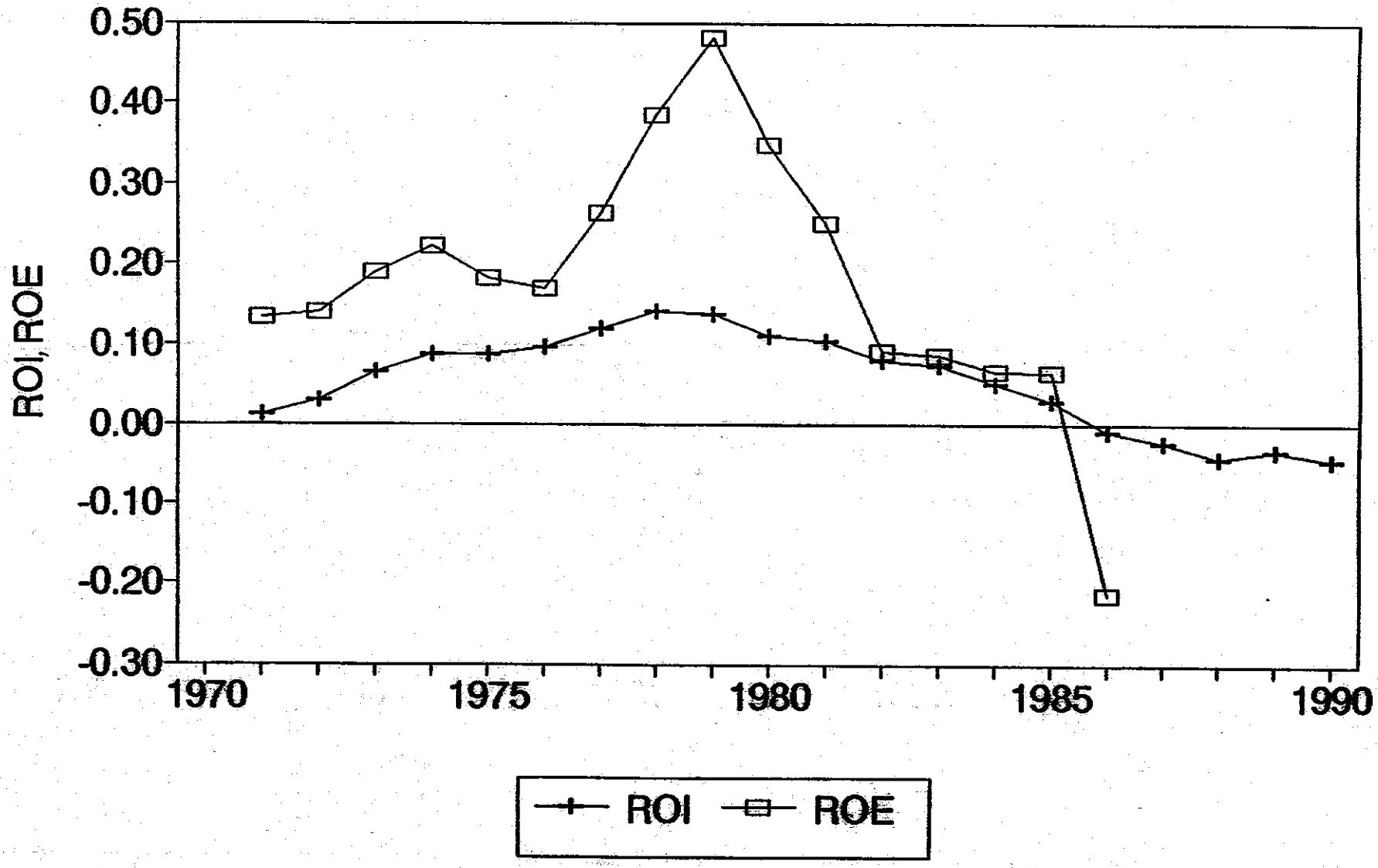


Figure 3b: Return On Investment (ROI) and Return On Equity (ROE) (averaged over three years) of IAI Co.

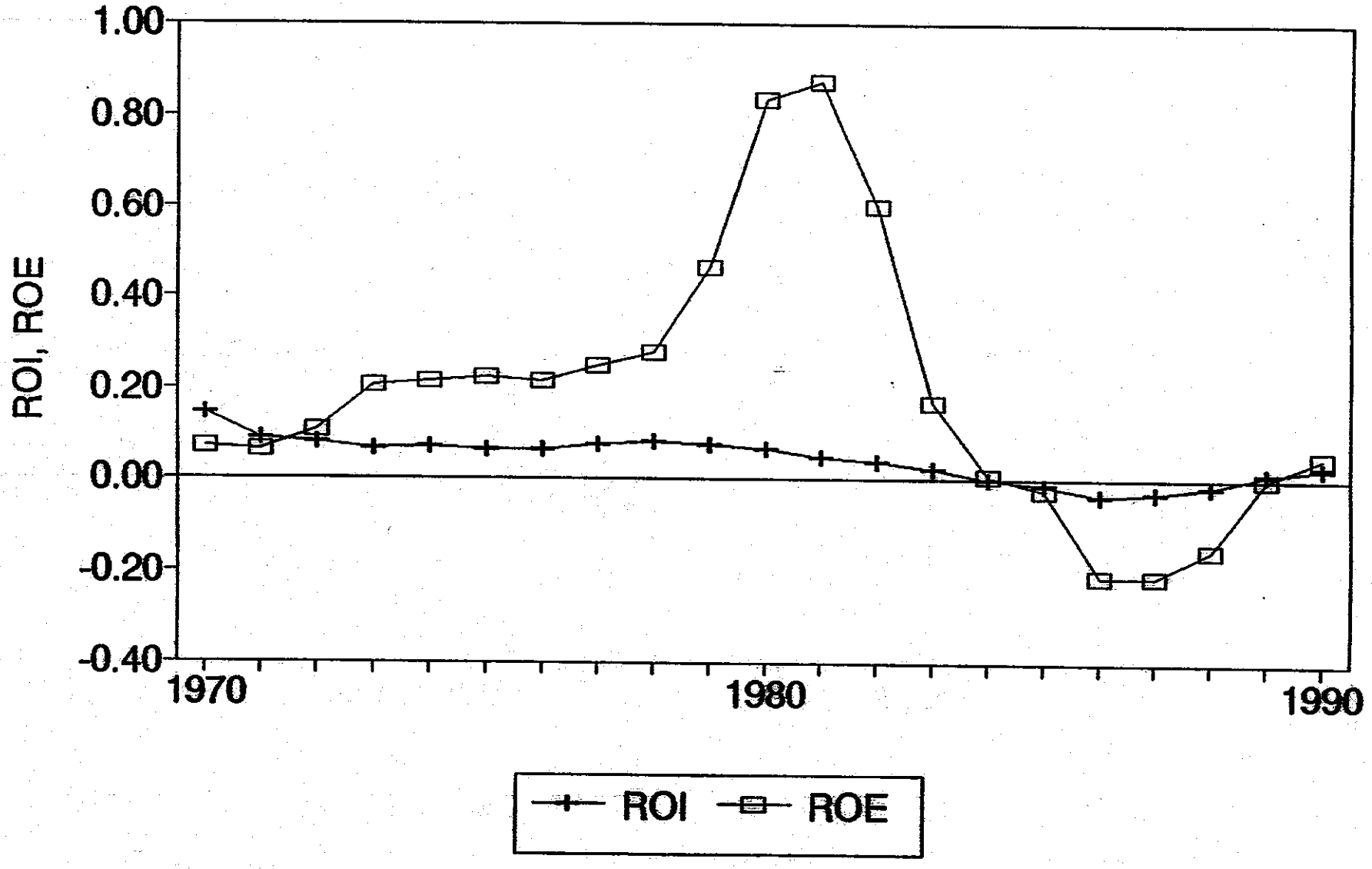


Figure 3c: Return On Investment (ROI) and Return On Equity (ROE) (averaged over three years) of Dead Sea Co.

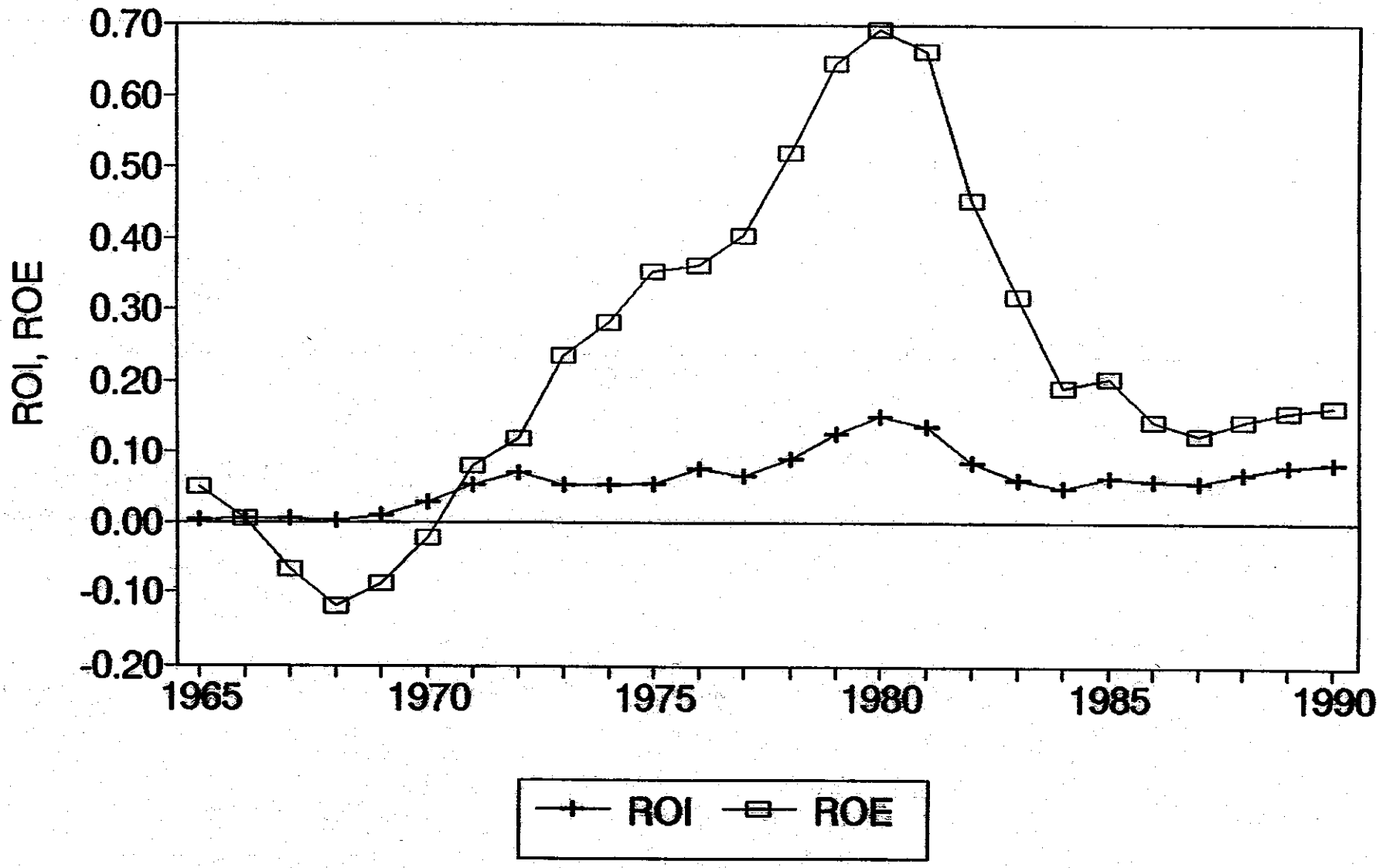


Figure 3d: Return On Investment (ROI) and Return On Equity (ROE) (averaged over three years) of Scitex Co.

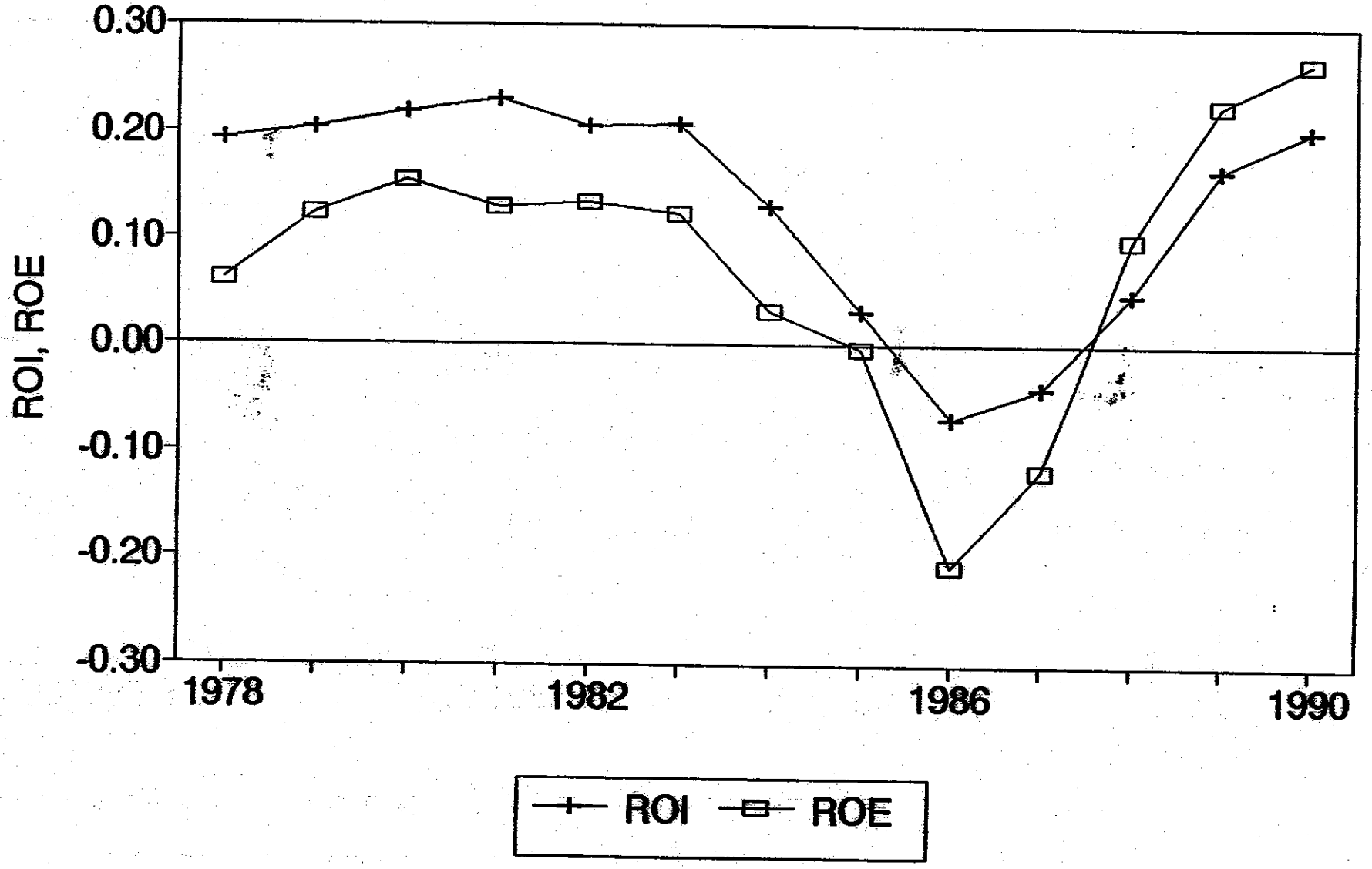


Figure 3e: Return On Investment (ROI) and Return On Equity (ROE) (averaged over three years) of Teva Co.

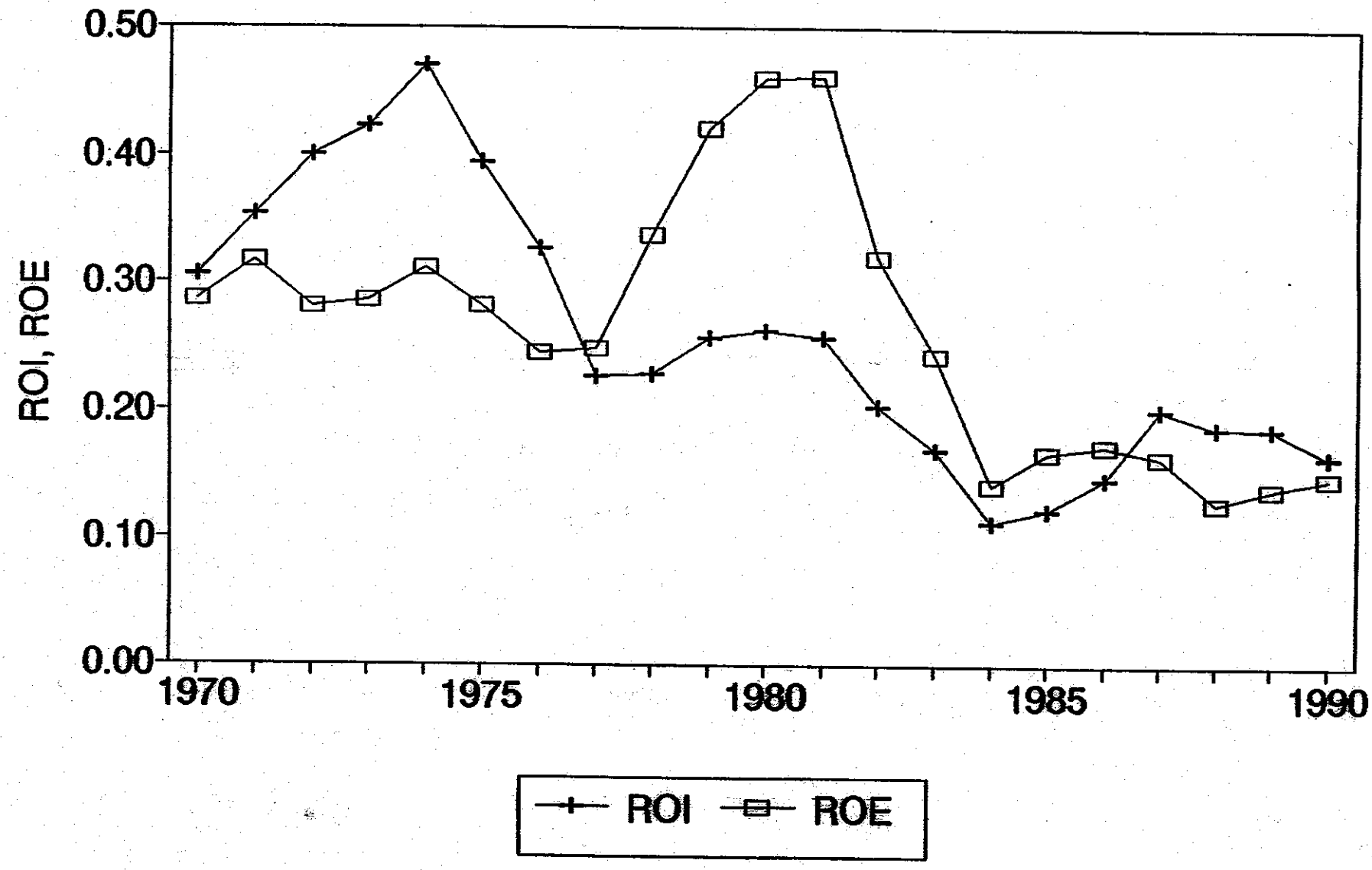


Figure 3f: Return On Investment (ROI) and Return On Equity (ROE) (averaged over three years) of Elbit Co.

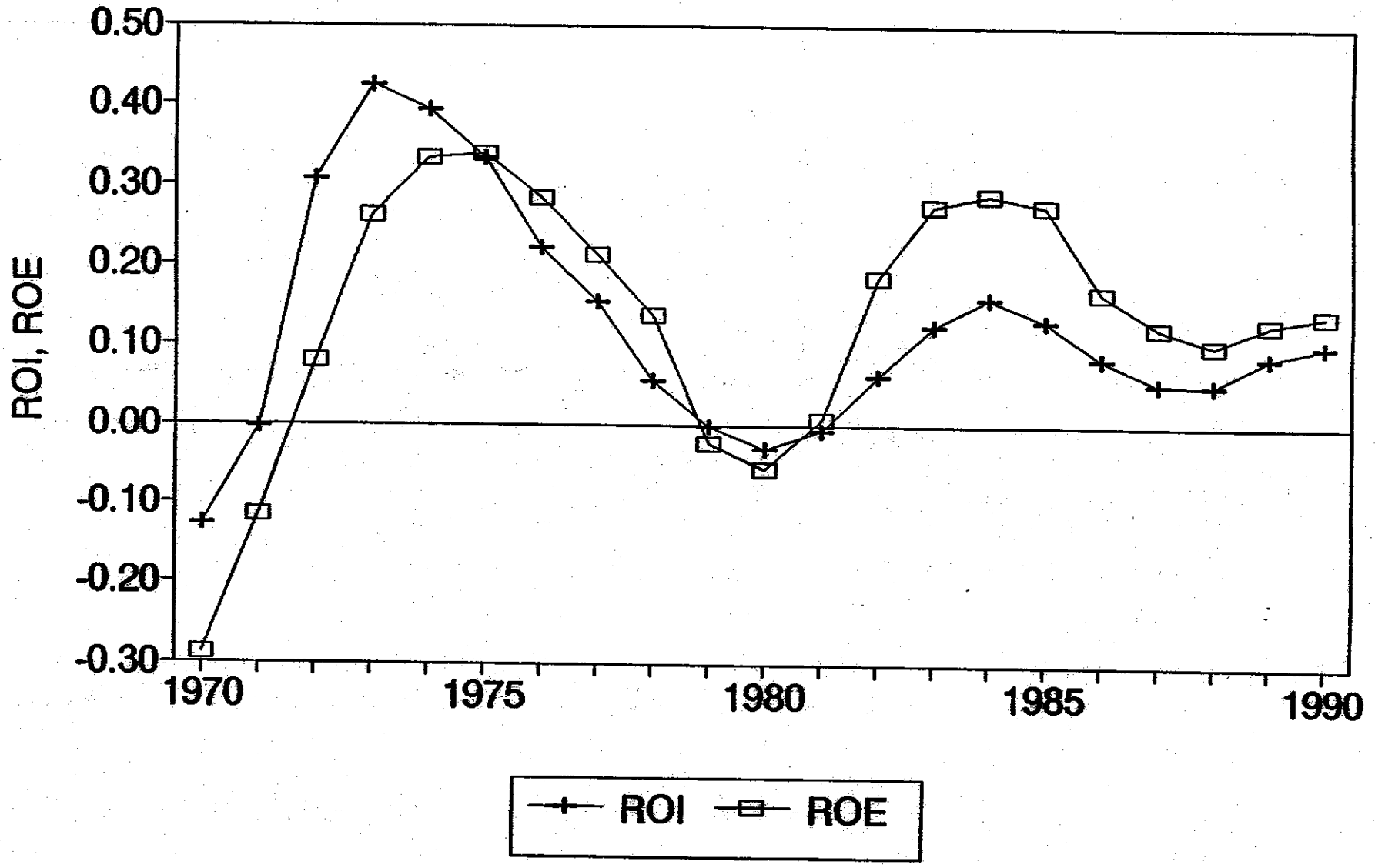


Figure 3g: Return On Investment (ROI) and Return On Equity (ROE) (averaged over three years) of Polgat Co.

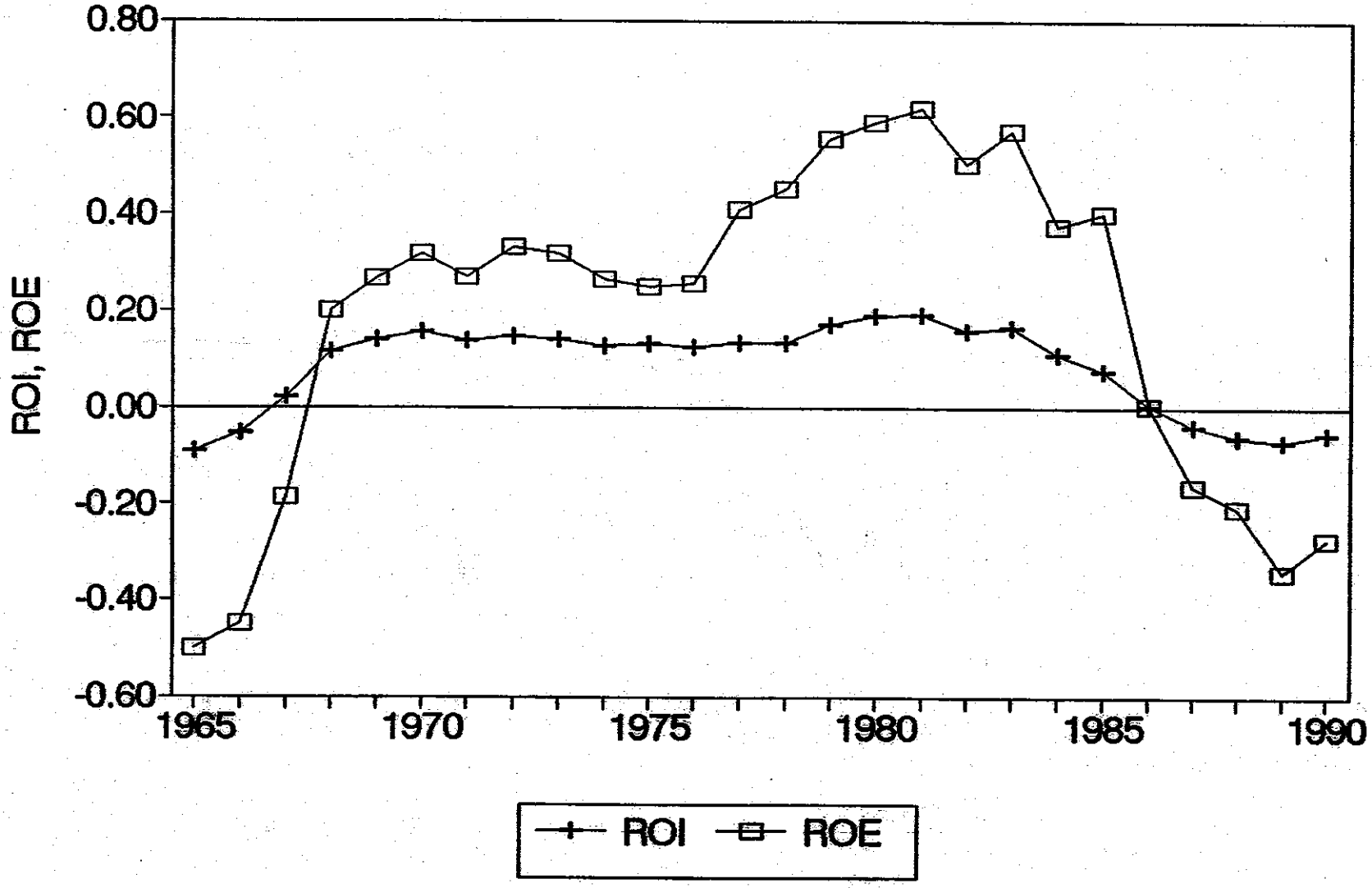


Figure 4a: Return On Investment (ROI) (averaged over three years) of IAI Co. compared with Boeing

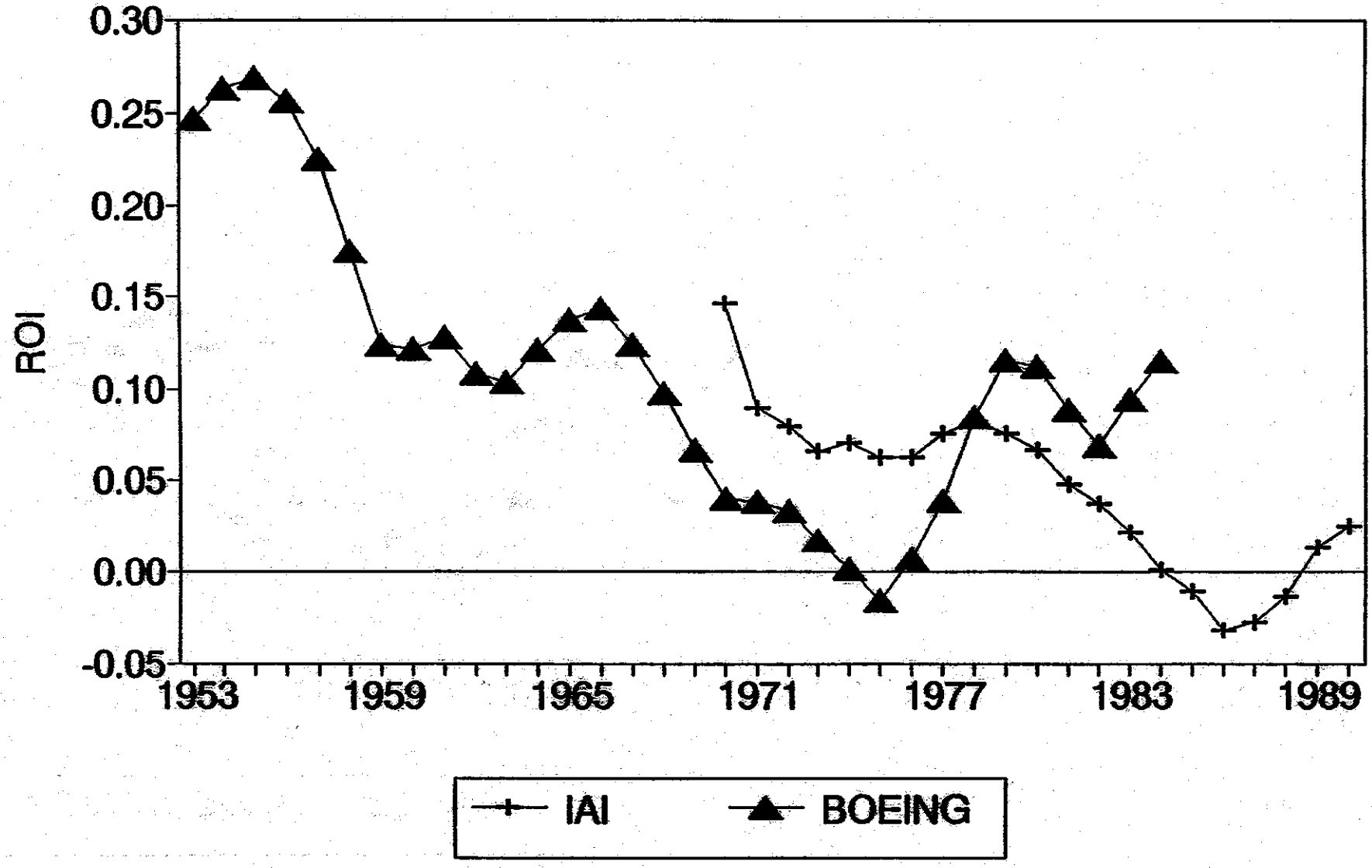
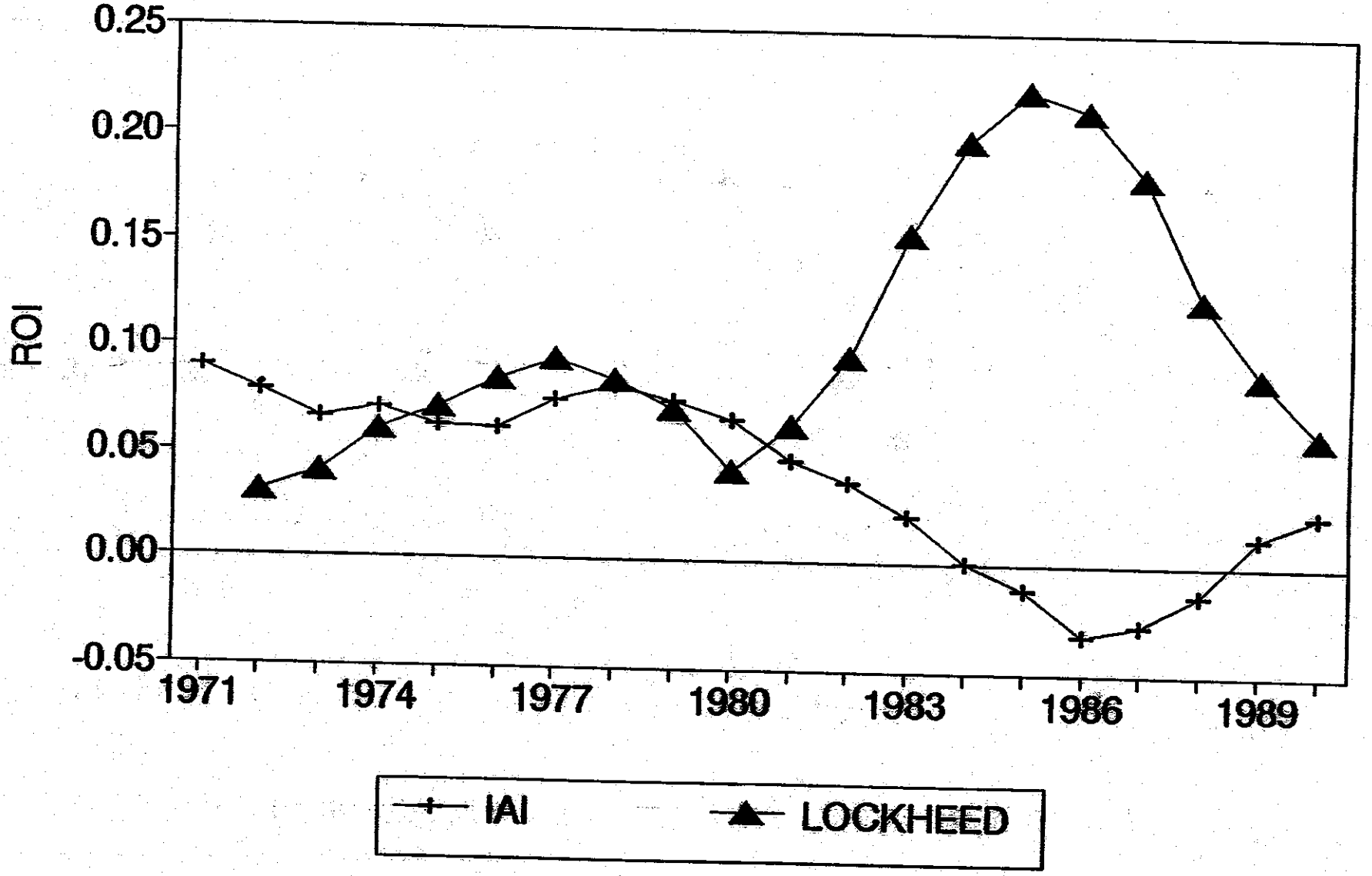


Figure 4b: Return On Investment (ROI) (averaged over three years) of IAI Co. compared with Lockheed



44

Figure 4c: Return On Investment (ROI) (averaged over three years) of Dead-Sea compared with Ethyl

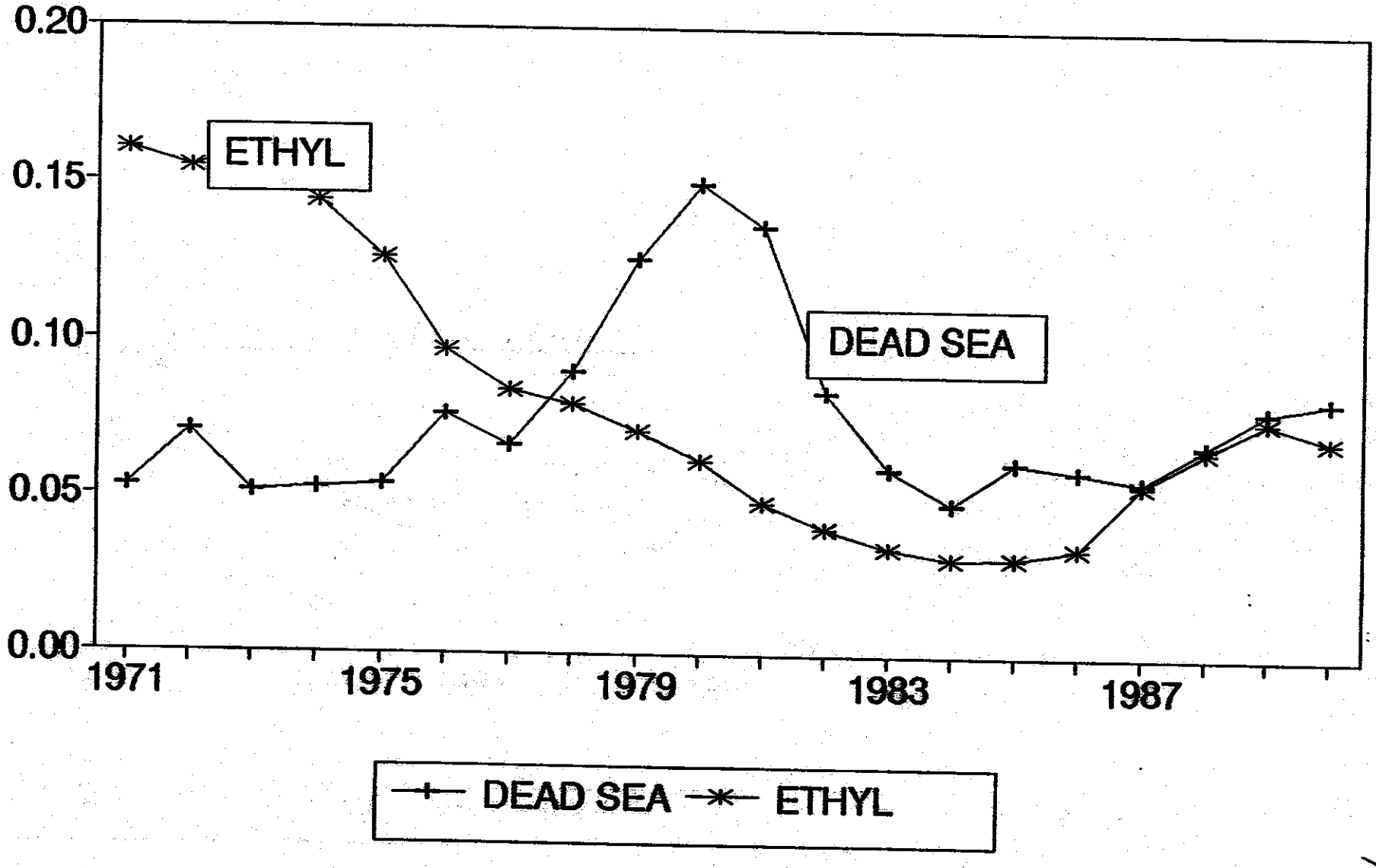


Figure 4d: Return On Investment (ROI) (averaged over three years) of Teva Co. compared with Merck

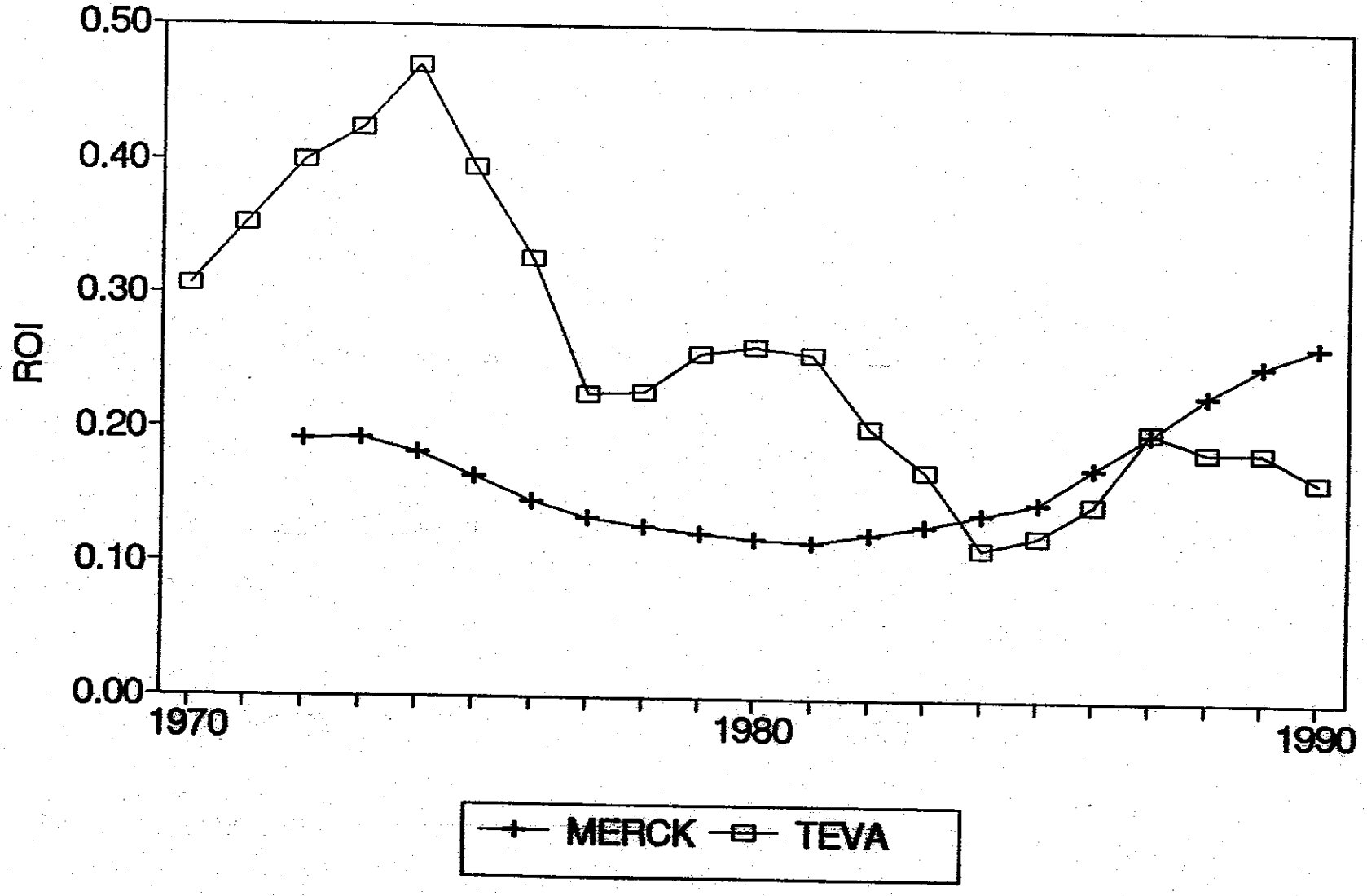


Figure 4e: Return On Investment (ROI) (averaged over three years) of Elbit Co. compared with Intel

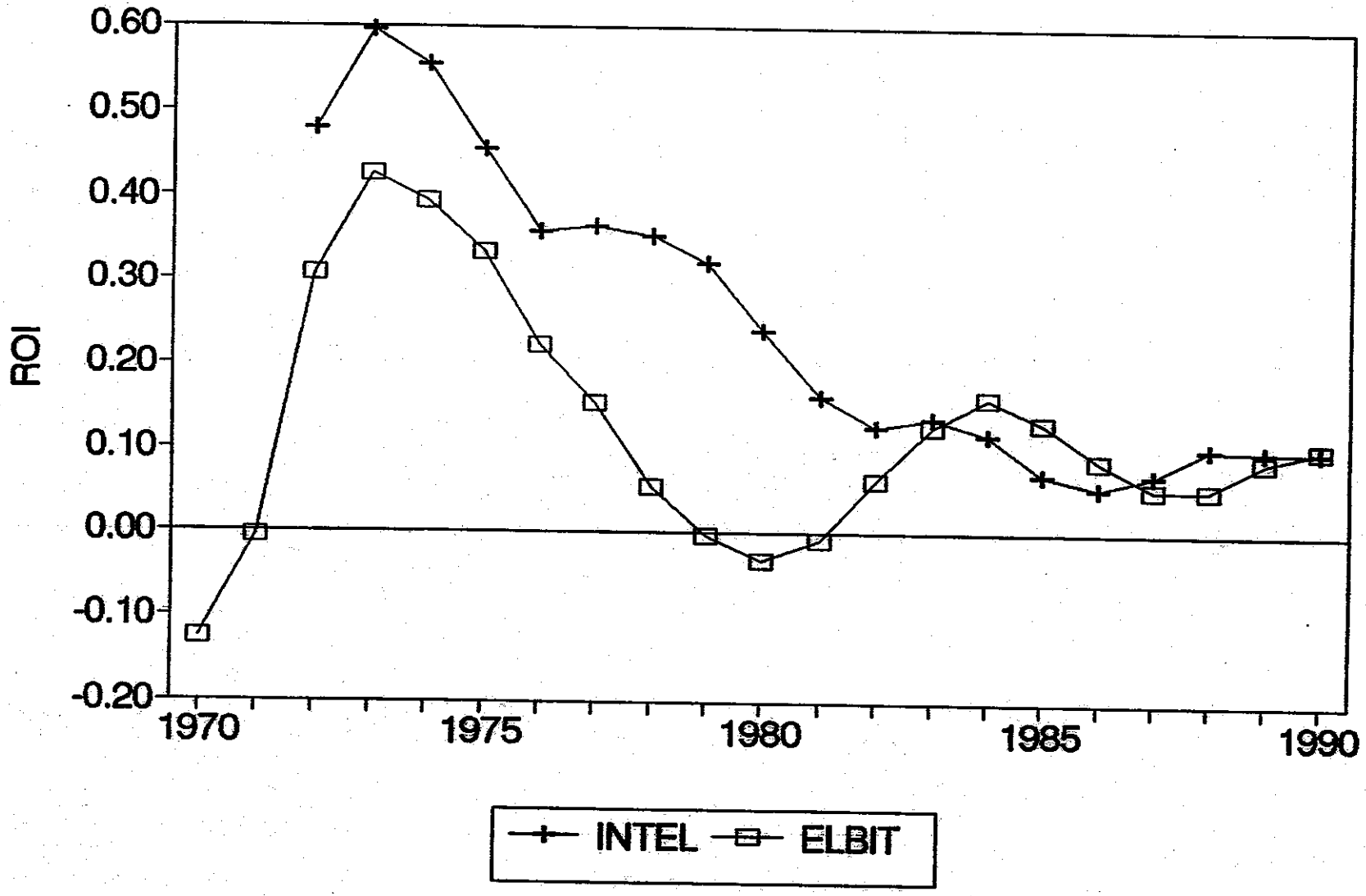


Figure 4f: Return On Investment (ROI) (averaged over three years) of Polgat Co. compared with Philips Van Heusen

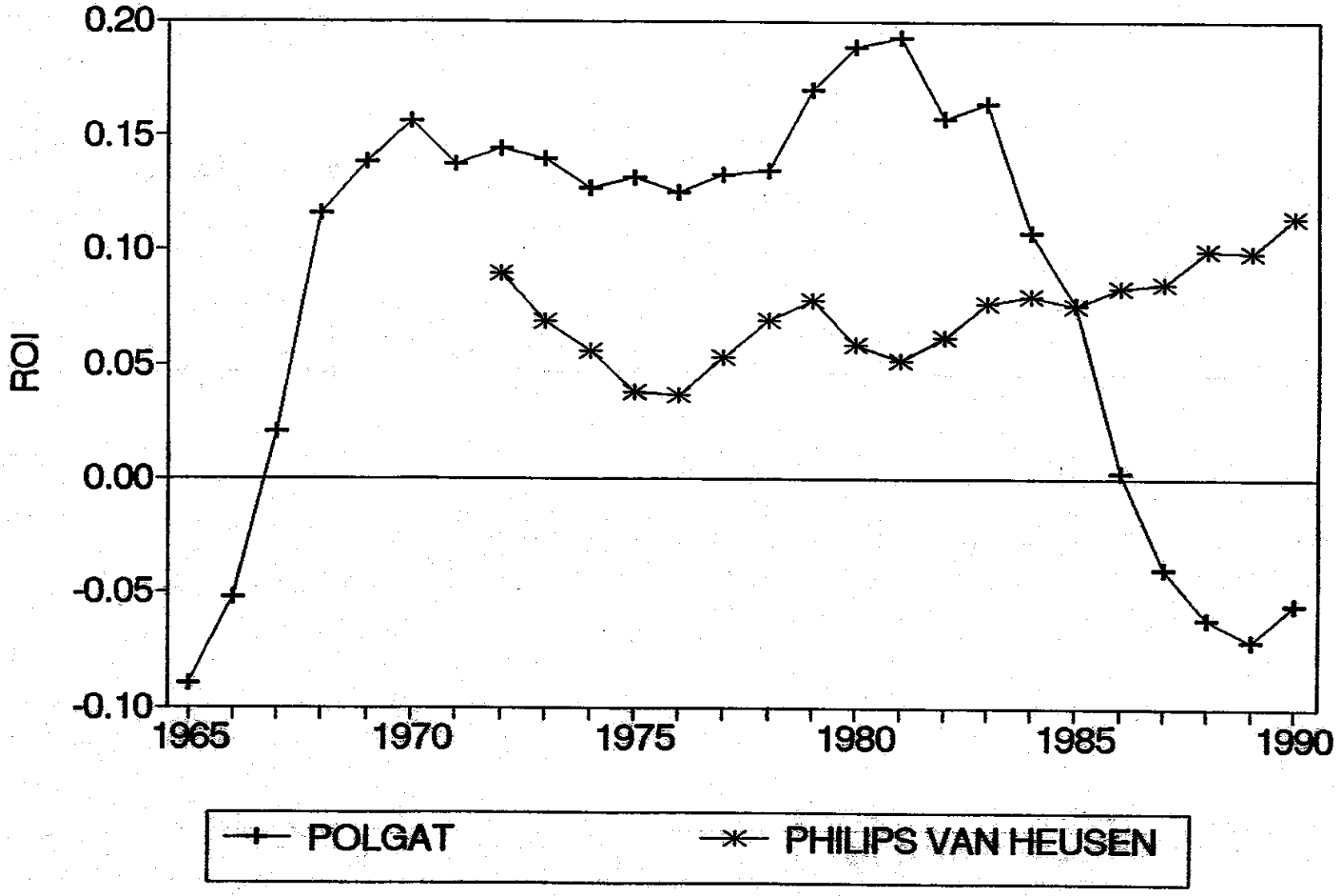


Figure 5: Return On Investment (ROI) and Return On Equity (ROE) (averaged over five years) of IBM Co.

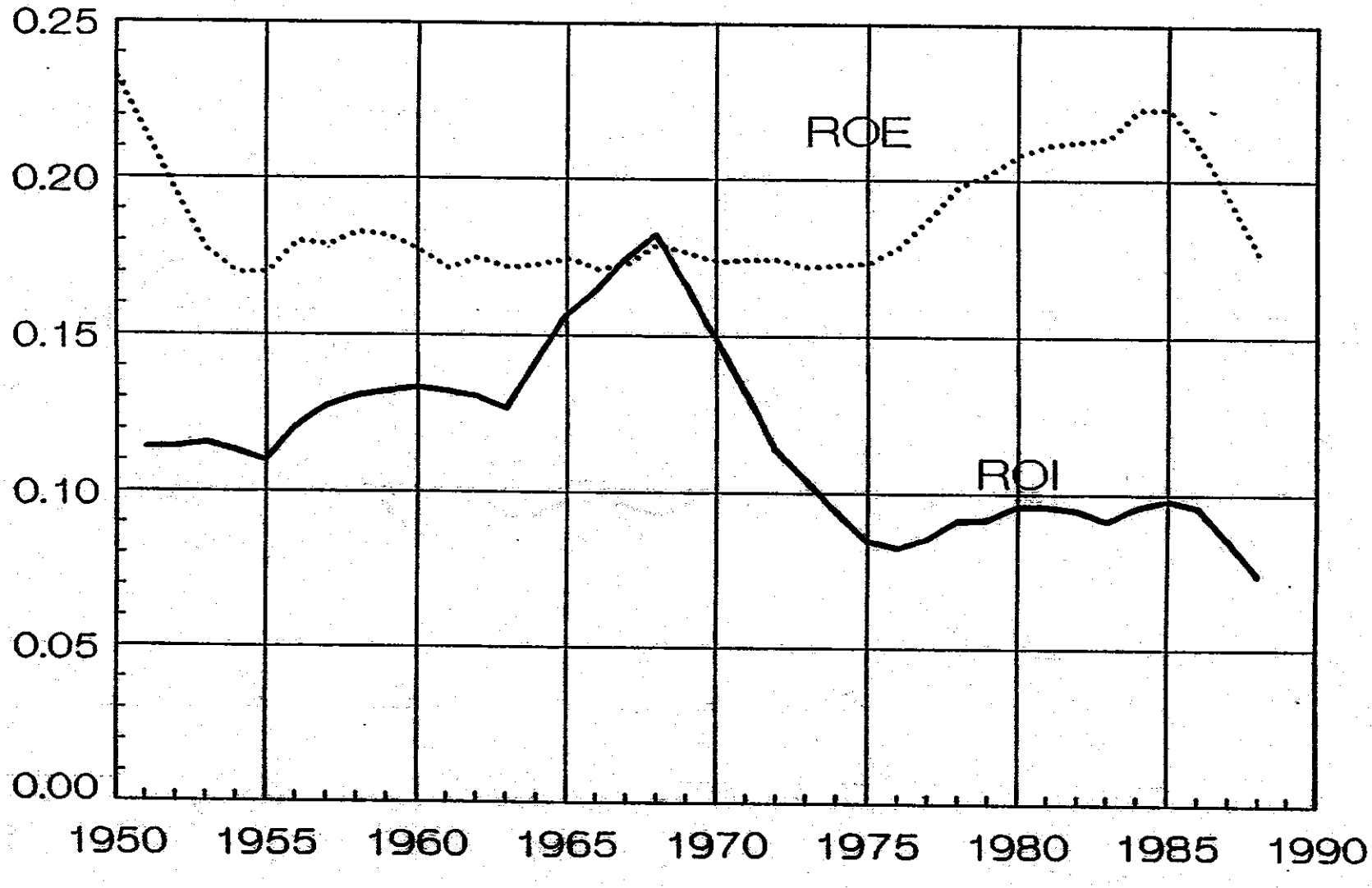


Figure 6: Effect of government policy: Return On Investment (ROI) (averaged over three years) sensitivity to salary and Dollar exchange rates for IAI

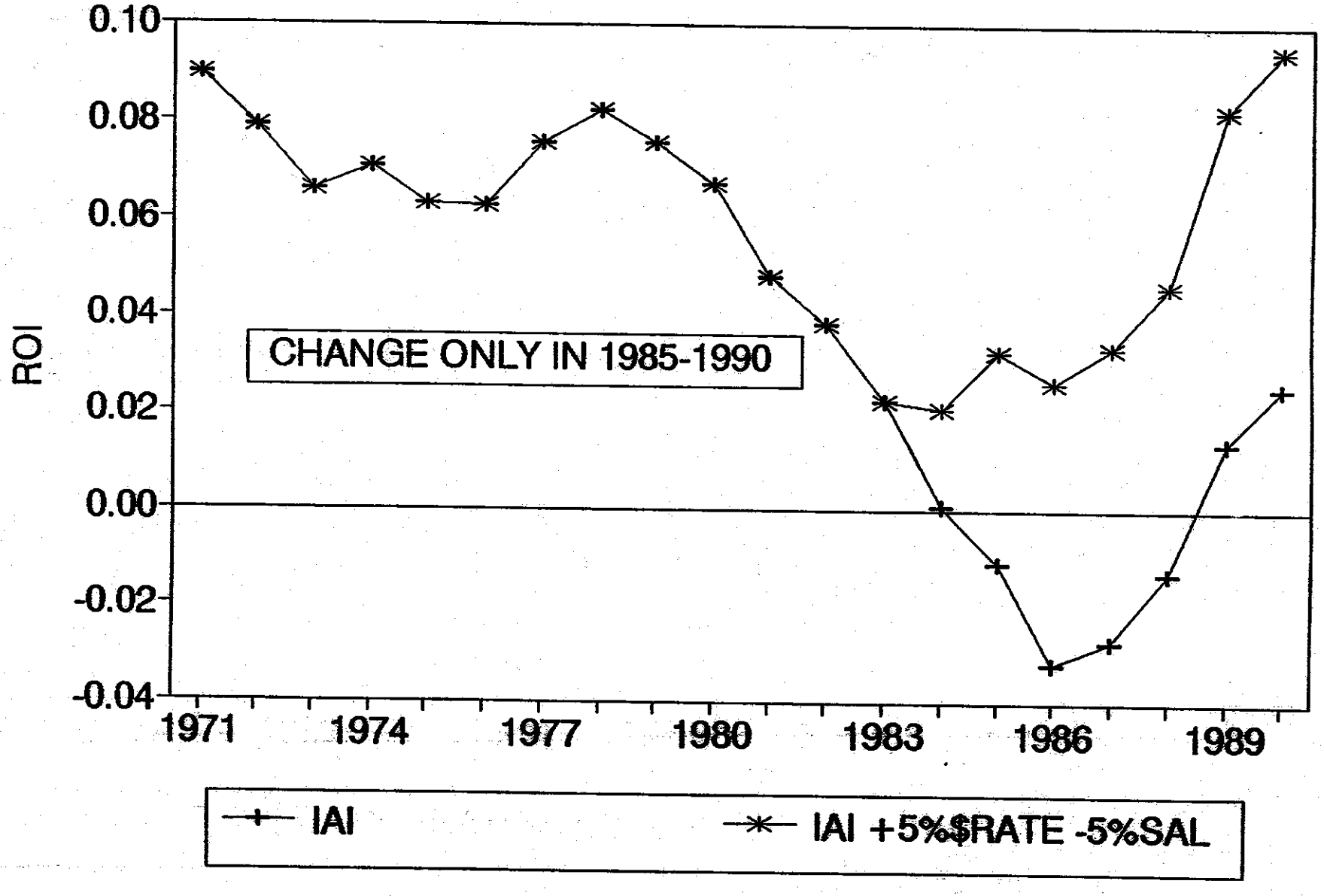


Figure 7: Gross Domestic Products (GDP) contribution of three selected Israeli companies

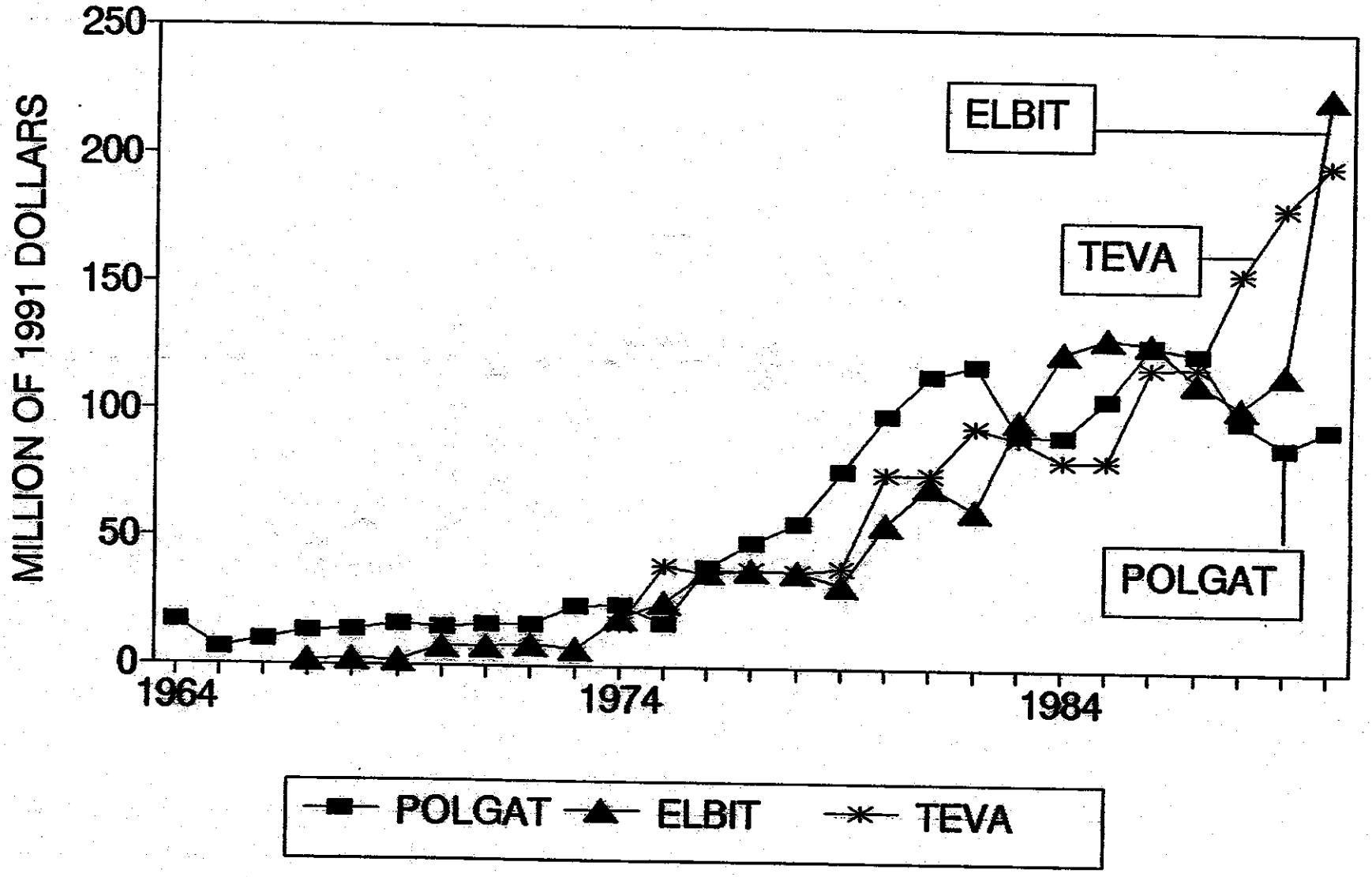


Figure 8a: Net Investment and Active Investment of Elbit

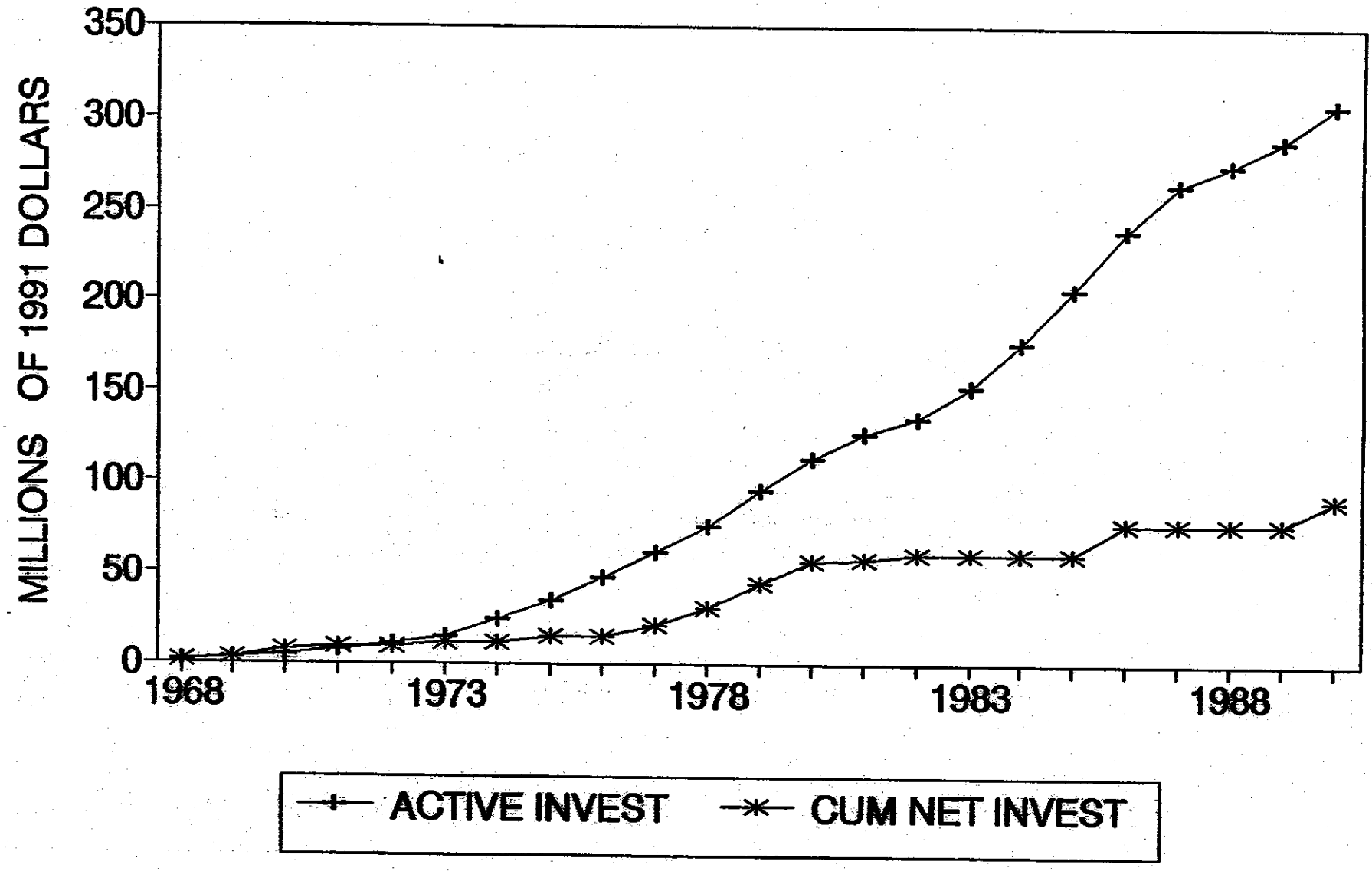


Figure 8b: Net Investment and Active Investment of Teva

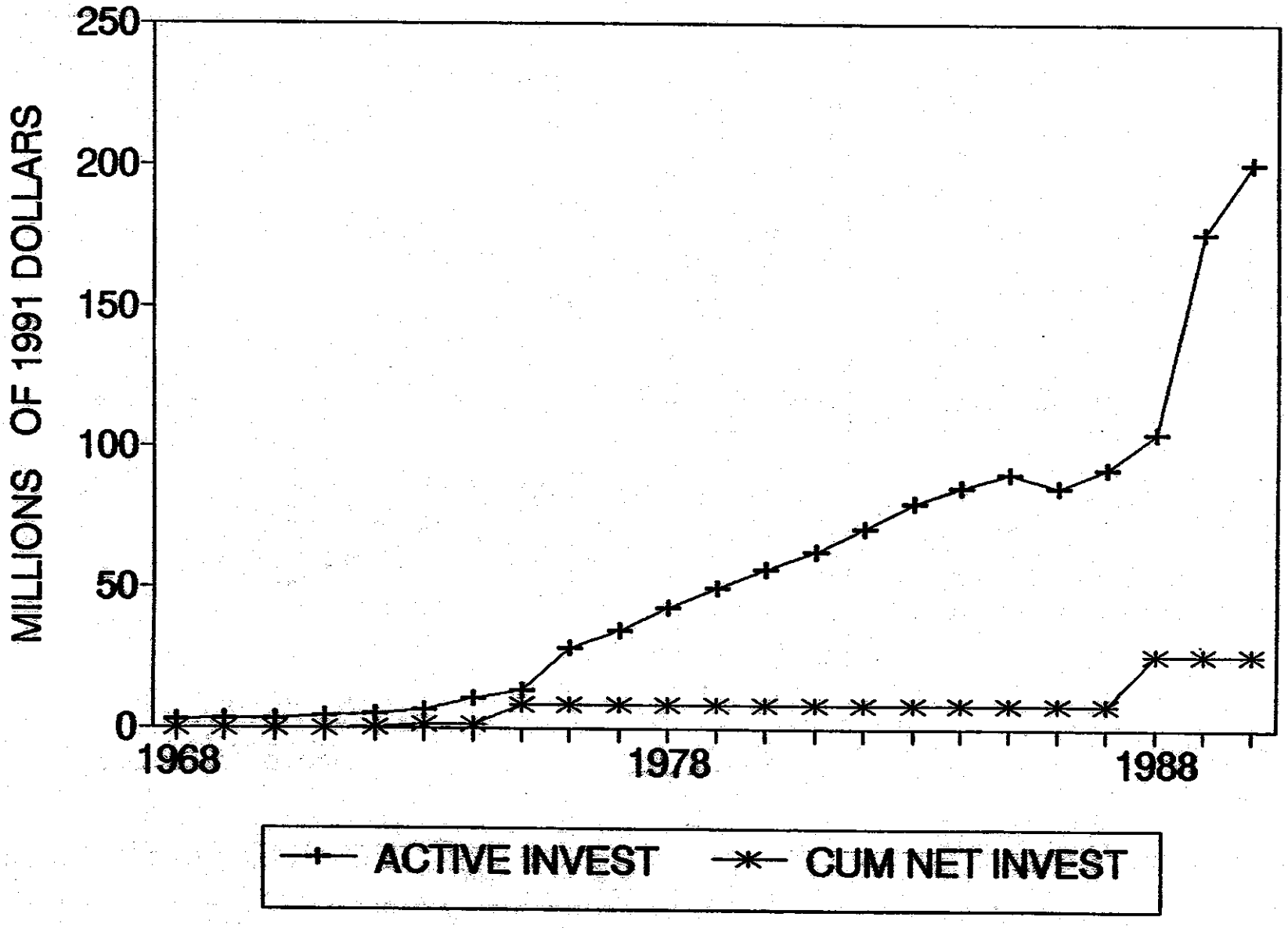


Figure 8c: Net Investment and Active Investment of Polgat

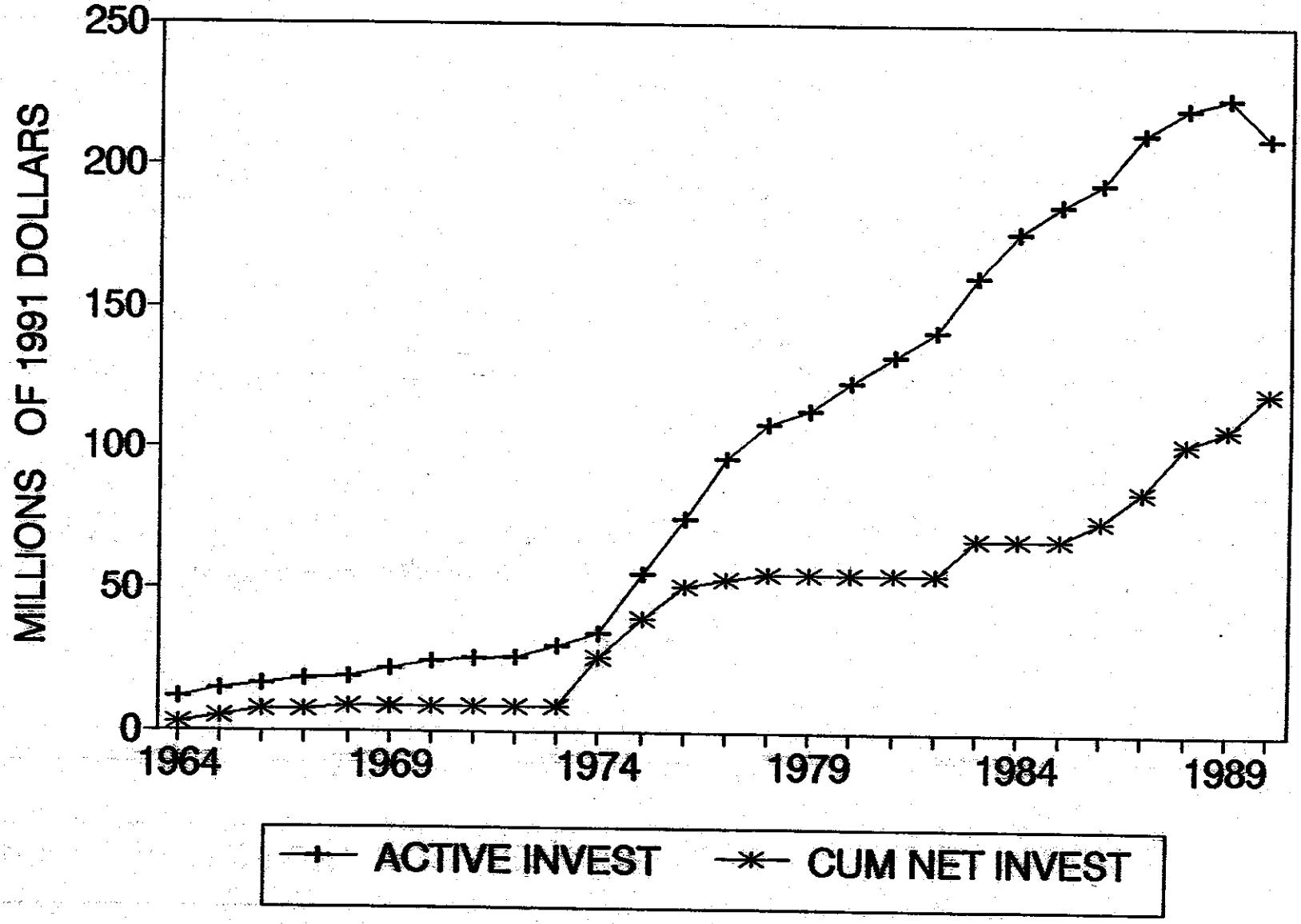


Figure 9a: GDP Contribution / Net Investment of three selected Israeli companies

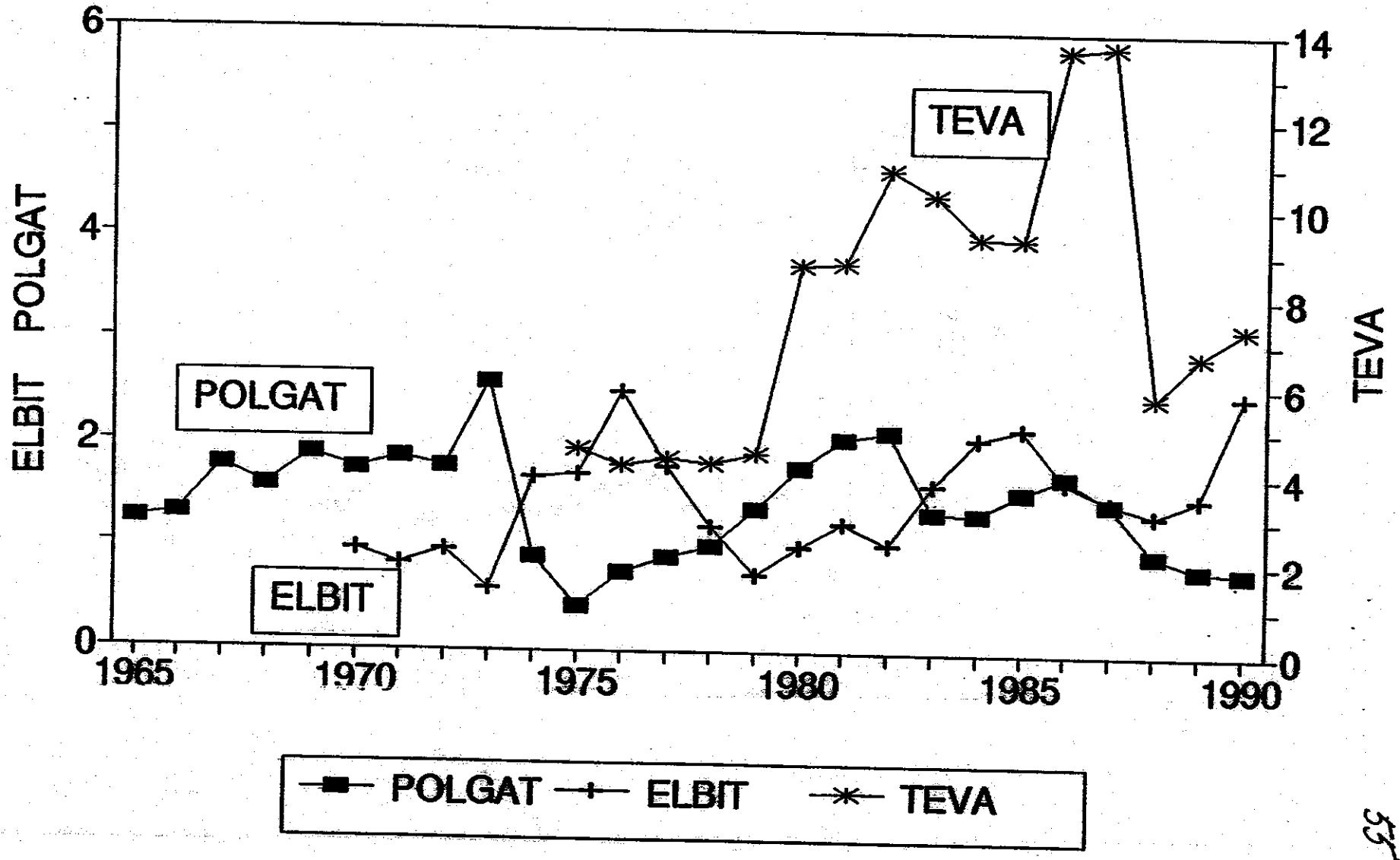


Figure 9b: GDP Contribution / Active Investment per year of three selected Israeli companies

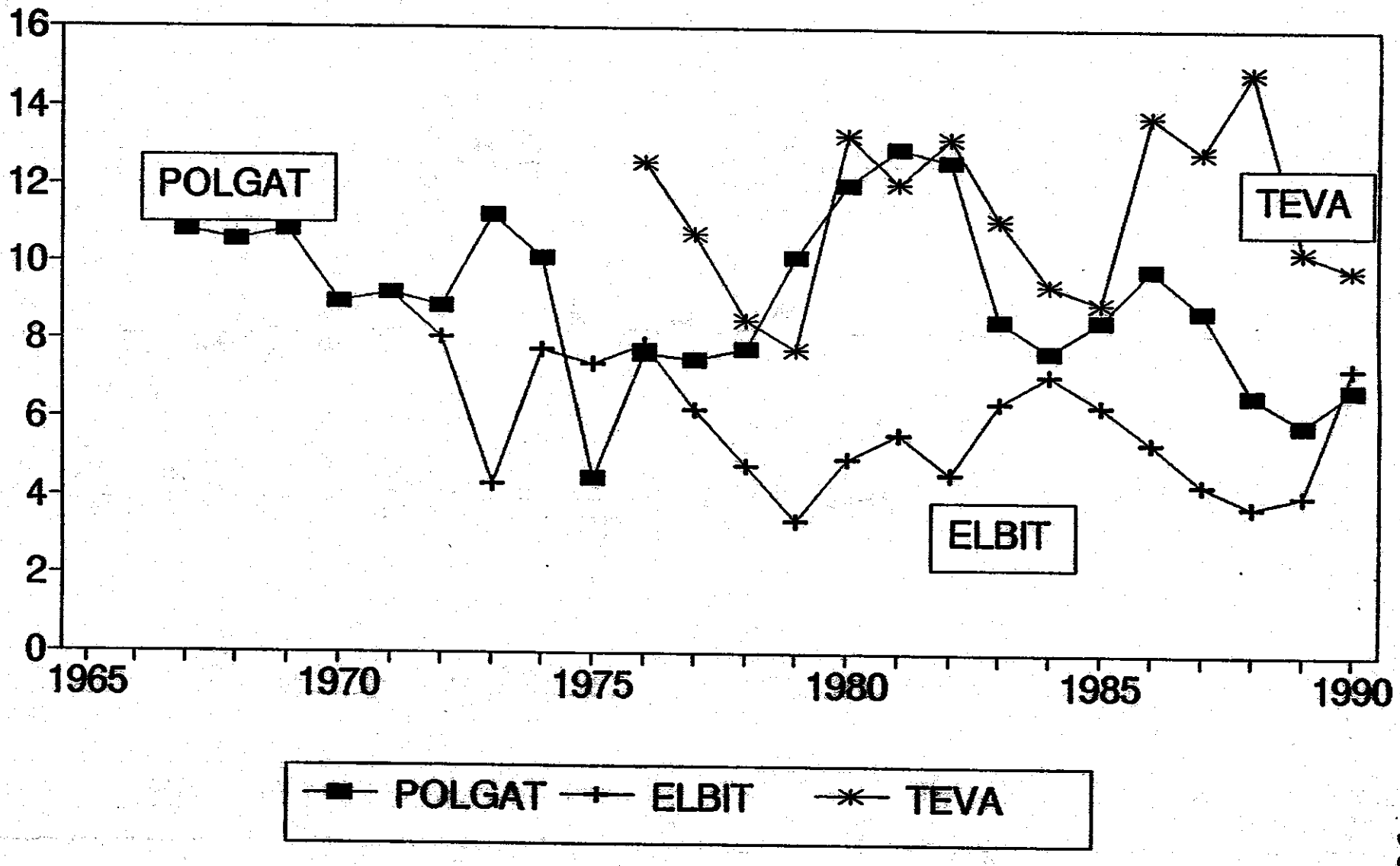


Figure 10: Cumulative GDP / Cumulative Net Investment of three selected Israeli companies