WORKING PAPERS

THE PRICE AND PROFIT EFFECTS OF HORIZONTAL MERGERS: A CASE STUDY

David M. Barton

and

Roger Sherman

WORKING PAPER NO. 98

August 1983

BUREAU OF ECONOMICS
FEDERAL TRADE COMMISSION
WASHINGTON, D.C.

THE PRICE AND PROFIT EFFECTS OF HORIZONTAL MERGERS: A CASE STUDY*

David M. Barton
Bureau of Economics,
Federal Trade Commission

Roger Sherman
Department of Economics,
The University of Virginia

The analysis and conclusions set forth in this study are those of the authors and do not necessarily reflect the views of Commission Staff or the Commission itself. All data and other information used in the study are in the public domain. This includes information obtained by the Commission which has become part of the public record.

* For helpful comments on earlier drafts we thank Ron Lafferty, Paul Pautler and Rich Sciacca.

I. Introduction

The economic rationale behind antitrust concern for horizontal mergers rests primarily on the the familiar structure-performance paradigm that links market concentration with supra-competitive profits and, implicitly, with higher prices. A vast empirical literature has demonstrated a positive statistical relationship between measures of industry structure, such as entry barriers and concentration, and average industry profit using cross section data. A small number of cross section studies, most dealing with banking services, have claimed to find a positive relationship between concentrated market structure and price measures1/, but we are unaware of any study that traces the effect of an actual change in market structure on prices or profits. In this paper we exploit an unusual opportunity to test for price effects and estimate profit consequences of two acquisitions that resulted in substantial increases in the market share of the acquiring firm.

The evidence we examine arises from a recent Federal Trade Commission antitrust suit against Xidex corporation, the world's largest producer of duplicating microfilm. The Xidex case is unusual in three respects. (1) Although the size of the market is small (sales under $100 million), the acquisitions involved greater changes in market shares than are usual in antitrust actions. (2) The suit was brought five years after the first acquisition and two years after the second, so a post-acquisition record of price behavior exists for this example. Furthermore, the price data used in this study are actual transaction prices. (3) Special characteristics of the products allow a relatively

straightforward test for price effects of the acquisitions.

The next section provides background information concerning the firms and products involved. Following that, we describe the data and methodology used to estimate the price effects of the acquisitions, and present results which indicate significant price increases traceable to the acquisitions. We then offer estimates of the incremental profits attributable to those price increases. A final section provides a summary.

II. Background

The Federal Trade Commission brought an antitrust suit against Xidex Corporation in 1981 for its earlier acquisition of two competitors. The acquisitions, in 1976 and 1979, had eliminated a major rival of Xidex in each of its two main product lines, two types of "non-silver" duplicating microfilm known as "diazo" and "vesicular". These two types of microfilm employ photo-imaging processes that can only be used for making duplicate copies from "silver" (halide) originals.2/ They have a significant cost advantage compared to the alternative of using silver duplicating film (an advantage estimated at one-fourth to one-half the cost of using silver film) and are much simpler to handle and process.3/ Diazo and vesicular are used to make about 95% of all duplicate microfilm copies and an even larger percentage of microfilm copies of active business files.4/ Diazo and vesicular are closely competing alternatives for making duplicate copies, but not perfect substitutes.5/

In 1976 Xidex acquired the diazo business of Scott Graphics, Inc., increasing its U.S. market share in diazo microfilm from

40% to 55%. In 1979 it acquired the assets of Kalvar Corporation, increasing its U.S. market share in vesicular microfilm from 67% to 93% Combining the two products, the 1976 acquisition increased Xidex's share of U.S. "non-silver duplicating microfilm" sales from 46% to 55%, and the 1979 acquisition raised it from 61% to 70%.6/ Judging from market-share statistics, these acquisitions would appear to have had a significant impact on market structure. The issue we examine next is whether there were discernible effects on the prices of diazo and vesicular duplicating microfilm as a result of Xidex's extension of "market power" in the two product lines.

III. Price Effects

Methodology and Data. Our study uses data covering a ten year period. In order to identify and measure price effects due to the acquisitions, we have to control for the influence during that period of general inflation and changes in the costs of inputs specific to the production of diazo and vesicular microfilm. For example, the cost of plastic film base increased due to the increase in petroleum prices, which also affected the cost of coatings since the coatings for both films use petroleum based resins. For both types of film, the cost of the film base and chemicals used for the coatings are estimated to account for 50% to 70% of price.7/ Offsetting increases in materials cost and the effect of inflation on non-microfilm specific costs were gains in productivity as the result of increased coating line speeds and quality control improvements which improved yields.8/

To control for the influence of these factors on the level of

absolute prices and thereby isolate price effects of the acquisitions, we use price ratios of vesicular and diazo microfilm in given product "configurations." A product configuration is defined by physical dimensions of the film (width, thickness and length) and whether or not it has a special edge stripe for marking. Because of the similarity in materials and processes, the vesicular-to-diazo price ratio for a given configuration should not be much affected by changes in petroleum prices, productivity, or general inflation. In making diazo or vesicular microfilm a coating is applied to a roll of plastic film base, which is the same for both types of microfilm. The coated film base is then cut into strips of various widths and lengths in the case of roll microfilm or into small sheets for aperture cards or microfiche. The difference between the production of the two film types is that a different coating is applied, but even these have many basic ingredients in common and the processes used to coat the films are very similar.9/ We shall examine whether there is a change in the relative price ratio following the acquisition affecting each product line. We should note that our method of using price ratios to identify price effects from the acquisitions is biased against finding such effects to the extent that the two products are good substitutes. If they were perfect substitutes, increases in absolute prices might have no effect on the price ratio.

The price data used for this study are U.S. Government Services Administration (GSA) contract prices for eighteen configurations of diazo and vesicular microfilm for contract

years (ending June 30) 1973 to 1982. The prices are actual transaction prices determined by competitive bidding which takes place during the first quarter of each calendar year (for the contract year beginning July 1). Product specifications remained unchanged during this period.

The GSA purchase schedule for microfilm lists well over two hundred separate microfilm product "items".10/ A number of the product distinctions (film color and film speed, for example) are irrelevant for our purposes since the bid prices (for a given firm) did not vary by these distinctions.11/ We therefore collapsed the product classifications for each film type into a smaller group of relevant configurations. The price data used here are the average GSA contract prices (i.e., winning bid prices) of diazo and vesicular in the eighteen configurations that were common to both.12/ All of the matching configurations were for roll microfilm.

Because of the large volume of film purchased by the Federal Government, GSA prices are probably lower than average market prices.13/ However, our methodology for estimating the price effects of the acquisitions only assumes that GSA prices reflect the general trend in market prices. We believe this assumption is justified since marketing documents and testimony reveal that firms used these prices as reliable indices of market prices.14/

Price Comparisons. We adopt the convention of computing the price ratios for each of the eighteen matching configurations as the price of vesicular divided by the price of diazo, i.e., V_i/D_i ($i = 1,\ldots,18$). Post acquisition prices will be denoted by V'_i and D'_i. Unprimed, V_i and D_i denote "competitive benchmark"

prices, this term serving as shorthand for "the prices that would have obtained in the absence of the acquisitions." (As discussed later these benchmark prices may have been above true competitive prices.) For each configuration, we use the time series data on GSA contract prices to calculate the average price ratio for three subperiods.

R_{ci} = the average value of V_i/D_i (the competitive benchmark price ratio). The average price ratio prior to either acquisition, computed using prices for contract years 1972-73 through 1976-77.

R_{si} = the average value of V_i/D'_i. The average price ratio following the Scott acquisition, but before the Kalvar acquisition, computed using prices for contract years 1977-78 and 1978-79.

R_{ki} = the average value of V'_i/D'_i. The average price ratio following the Kalvar acquisition, computed using prices for contract years 1979-80 through 1981-82.15/

Suppose we expect the Scott acquisition to result in an increase in diazo prices above their competitive benchmark level. Our hypothesis then can be stated as

(1) $D'_i = D_i(1 + d)$, $d > 0$,

were d denotes proportional increase in diazo prices above their competitive benchmark levels. Divide (1) through by V_i and take the reciprocal to get an expression in terms of the V/D price

ratios,

$$(2) \quad V_i/D'_i = V_i/D_i(1 + d).$$

Thus, if $d > 0$ the V/D price ratio following the Scott acquisition will fall relative to the competitive benchmark price ratio. On substitution of the observed average price ratios, we have

$$(2') \quad R_{si} = R_{ci}/(1 + d).$$

Our estimate of d is calculated by solving for d in (2') as $d = R_{ci}/R_{si} - 1$.

In the case of the Kalvar acquisition, we are concerned about the effects on vesicular prices. The analogue to equation (2) is

$$(3) \quad V'_i/D_i = (V_i/D_i)(1 + v),$$

where v is the proportional increase in vesicular prices above their competitive benchmark level. In this case, however, we do not have data corresponding to the price ratio appearing on the left-hand side since the Kalvar (vesicular) acquisition occurred after the Scott (diazo) acquisition. We have two alternatives. The first is to use R_{si} and R_{ki} to estimate v. If we divide through (3) by (1 + d) and use (1), we have

$$(4) \quad (V'/D')_i = (V/D')_i(1 + v),$$

an equation containing price ratios corresponding to average price ratios, R_{ki} and R_{si}. Therefore one method of estimating v would be to use

(4') $R_{ki} = R_{si}(1 + v)$,

which yields an estimate of v calculated as $v = R_{ki}/R_{si} - 1$. The problem with this approach is that it implicitly assumes any effect of the Scott acquisition on diazo prices persisted during the period following Kalvar acquisition. Suppose the Scott acquisition had a positive but more brief effect on diazo prices. Since this effect is embedded in R_{si}, using (4') would result in an estimate of v that would be biased upward. We have adopted the more conservative approach of assuming that d = 0 at the time of the Kalvar acquisition. We use R_{ki} as defined above but compare it with R_{ci} rather than R_{si}. The estimate of v that we use is therefore given by $v = R_{ki}/R_{ci} - 1$.

Results. Statistical tests are given in Table 1. The values of R_{ci}, R_{si}, and R_{ki} for each of the eighteen matching configurations are given in the first three columns of Table 1, followed by the calculated values of d_i and v_i. We use the sample values of d_i and v_i to estimate d and v. The estimates are 0.111 and .228, respectively. The null hypotheses, d = 0 and v = 0, are each rejected in favor of the alternatives, d > 0 and v > 0, at the .01 level of significance or better.

****

Place Table 1 about here

****

Place Figure 1 about here

****

A picture is useful in conveying the circumstances behind the statistical results. In Figure 1 we have plotted the value of the average price ratio across all configurations for each contract year. The solid lines give the average values of R_{ci}, R_{si}, and R_{ki} from Table 1.16/ The hypothesis that the changes in market structure had a positive impact on prices implies that the average price ratio, measured as V/D, would fall following the Scott (diazo) acquisition and then rise following the Kalvar (vesicular) acquisition. This pattern is clearly evident in Figure 1. In addition, since the Kalvar acquisition gave Xidex a near monopoly in vesicular, one would expect the price effect of this acquisition to be greater than that of the Scott acquisition, as it appears to be. Note also that the average value of V/D has a rising trend following the Kalvar acquisition. This is consistent with (but, of course, does not confirm) the possibility that the price impact of the Scott acquisition was being dissipated, since a decline in d from its initial value would be reflected in a rising value for the V/D price ratio.

IV. Estimates of the Short-run Effects on Profits

We now turn to estimating the impact of the acquisitions on Xidex's profits. The acquisitions may have increased profits through economies of scale in production and distribution or from Xidex's superior management skill.17/ Our interest, however, is with the increase in profits due to the elevation of prices above their competitive benchmark levels. We denote these "supra-

competitive" profits as π' (with subscripts d and v where appropriate).

****

Place Figure 2 about here

****

Methodology. To estimate supra-competitive profits we take Xidex sales revenue for each product line separately following the acquisition affecting that product line and then subtract the estimate of sales at competitive benchmark prices. In Figure 2 let DD represent Xidex's (annual) demand curve for one of the two products in a particular post-acquisition year. P' and Q' are post acquisition price and quantity; P denotes the benchmark competitive price and Q the quantity that Xidex would sell at that price. Total sales revenue, S = P'Q', is the sum of areas A, B, and C. Our estimate of supra-competitive profit due to the price effect of the acquisition is given by area A. Using the relationship

5) $P' = P(1 + j), \quad j = d \text{ or } v,$

the dollar value of areas B + C is given by

6) $$PQ' = \frac{P'Q'}{(1 + j)} = \frac{S}{(1 + j)}.$$

So the value of π' (area A) is given by

7) $$\pi' = P'Q' - PQ' = S \frac{j}{(1 + j)}.$$

The estimates of supra-competitive profits on diazo and vesicular

microfilm for post acquisition years are calculated from (7) using annual sales revenue for the product in question and our estimates of d or v substituted for j. These estimates are given in last two columns of Table 2.

****

Place Table 2 about here.

****

Qualifications. Before discussing them further, we need to discuss a source of possible upward bias in these profit estimates and to point out sources of offsetting downward bias that are due to our conservative assumptions. In Figure 2, area A measures the gain in profits due to the price effects of the acquisition correctly only if P is the "true" competitive price yielding no excess profits. Recall, however, that P is an estimate of the price that would have obtained had the acquisition not taken place. Since the sales for both diazo and vesicular were highly concentrated in few sellers before the acquisitions, prices might have been above competitive levels due to oligopolistic behavior. If P actually is above the true competitive price, P_c, then the value of the profit gain (due to price increases) is A minus D rather than A alone. Our procedure for estimating π' thus assumes Xidex was earning only a competitive rate of return at price P; in other words it implicitly assumes $P = P_c$. If $P > P_c$, then our procedure overstates the gain in profits attributable to the price

increases.

In order to get a feel for the magnitude of the bias assume that marginal costs are constant over the interval Q'Q. The dollar values of areas A and D are given by

$$A = (P' - P)Q' \quad \text{and}$$

$$D = (P - P_c)(Q - Q').$$

The relative size of the bias is, therefore, given by

$$(8) \quad \frac{D}{A} = \frac{P - P_c}{P' - P} \left(\frac{Q - Q'}{Q'} \right)$$

Let m represent the proportional difference between P and P_c, as $m = (P - P_c)/P$, or $P(1 - m) = P_c$. Using this definition of m we can restate (8) as

$$(9) \quad \frac{D}{A} = \frac{m\,P}{P' - P_c} \left(\frac{Q - Q'}{Q'} \right)$$

Now a reasonable definition of arc elasticity of demand, with primes denoting new prices and quantities, is

$$(10) \quad E = \frac{P}{Q'} \frac{Q' - Q}{P' - P}.$$

Instead of P and Q or P' and Q', the reference point is an average over the arc obtained by using P and Q' which is closer to the middle of the arc.18/ From equations (9) and (10) it is clear that the size of D/A depends on how much P exceeds P_c, captured by m, and on the absolute value of price elasticity of

demand:

$$(11) \qquad \frac{D}{A} = m \mid E \mid .$$

Thus, as long as demand is not very elastic over the interval P'P and m is quite small, area A in Figure 2 will be a good estimate of the gain in profits due to the price effects of the acquisition.

The net bias from our procedure for estimating the gain in profits is likely to be small (and may be negative) because of three instances in which we took the conservative option in estimating magnitudes that affect our estimates of π'. First, in estimating v, recall that we assumed d was zero, i.e., the price effect of the Scott acquisition vanished at the time of the Kalvar acquisition. If the price effect of the Scott (diazo) acquisition was not entirely eroded by then, the average value of v_i would be larger than .228; thus our estimate of π'_v based on v = .228 would be biased downward.

Second, consistent with using d = 0 in calculating v, we have assumed that $\pi'_d = 0$ following the Kalvar acquisition; no supra-competitive profit from the Scott (diazo) acquisition is included after fiscal year 1979 (see Table 2). Notice we also ignore the possibility of any supra-competitive profit on diazo for fiscal year 1977 even though the Scott acquisition took place in June 1976. We do this because we use the bidding on GSA contracts to date price increases. The bidding on GSA contracts for fiscal year 1977 took place in early 1976, four or five months before the acquisition, so we conservatively date the price increase in

diazo at the time of the bidding for the 1977-78 contract year which took place in early 1977 (the first round of GSA bidding following the Scott acquisition). However, it is surely possible that price increases in diazo were reflected in sales to non-GSA customers during fiscal year 1977.

The third instance of conservatism concerns our method of calculating total sales for each product line following the Kalvar acquisition. For this period sales data for diazo and vesicular are not separately available. To separate sales by product line we used the proportions from the last fiscal year in which separate sales data were available, 1979. This almost certainly understates the proportion of vesicular sales in later years, since the Kalvar acquisition removed Xidex's only real competition in vesicular. Of course if we have understated the proportion of total film sales that were vesicular, we have understated the sales base used to calculate the supra-competitive profit on vesicular and thus understated the amount of such profits.

Results. Our estimate of supra-competitive profit for diazo is $4,176,000 in fiscal years 1978 and 1979 and for vesicular is $7,869,000 in fiscal years 1980 and 1981. To put these figures in perspective, the purchase price of Scott was $4,225,000 and that of Kalvar was about $6 million.19/ In each case estimated gain from raising prices (relative to competitive benchmark levels) was sufficient to recoup the cost of the acquisition in two years. Even if our estimates of supra-competitive profit contain some upward bias, which we have attempted to avoid, the

acquisitions would appear to be handsome investments.

V. Summary

A Federal Trade Commission suit against Xidex Corporation, challenging it acquisitions of Scott Graphics in 1976 and Kalvar Corporation in 1979, has yielded an unusual opportunity to observe price behavior before and after the acquisitions. Each acquisition involved a substantial gain for Xidex in its share of a well defined microfilm product line. The materials and processes used in producing the two products are so similar that a ratio of prices can be used to control for input price or productivity changes which would affect the level of absolute prices over the time period covered by our study. Prices in each affected product line were found to increase after the acquisition occurred. It was also possible to estimate the profit gain due to the price increases. The price increases yielded substantial profit gains, in each case sufficient to recover the cost of the acquisition in about two years.

Litigation in the Federal Trade Commission antitrust suit against Xidex began in December 1981 and ended in March 1982 when Xidex agreed to settlement by consent. The consent allows Xidex to retain the acquisitions with the exception of Kalvar's vesicular technology and knowhow which it is required to divest. In addition, the consent requires licensing of Xidex's proprietary vesicular technology at below market-rates and royalty-free licensing of diazo technology. After an extended period for public comment, the final order became effective on July 7, 1983.20/

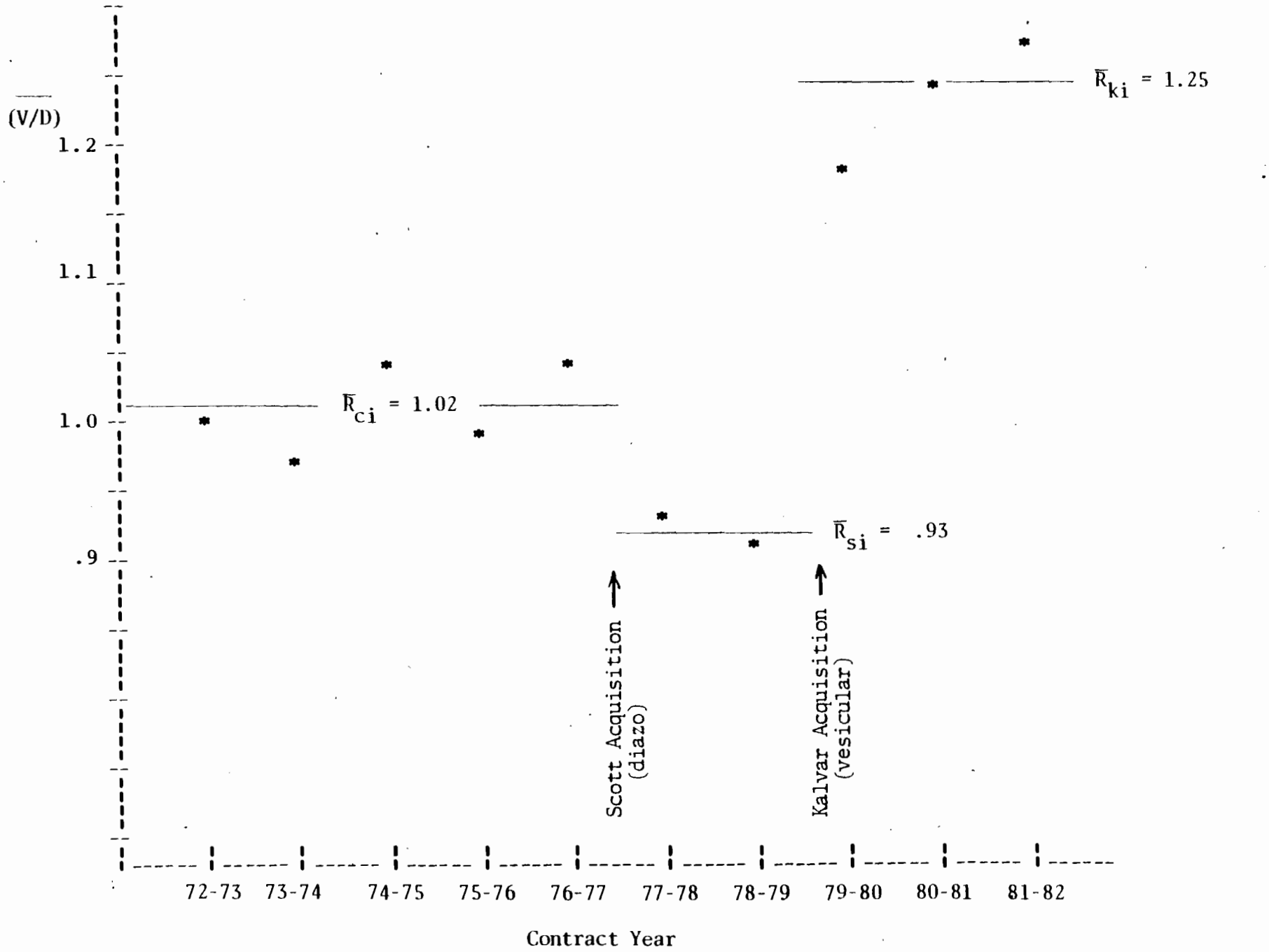

Figure 1: Behavior of Average Price Ratio

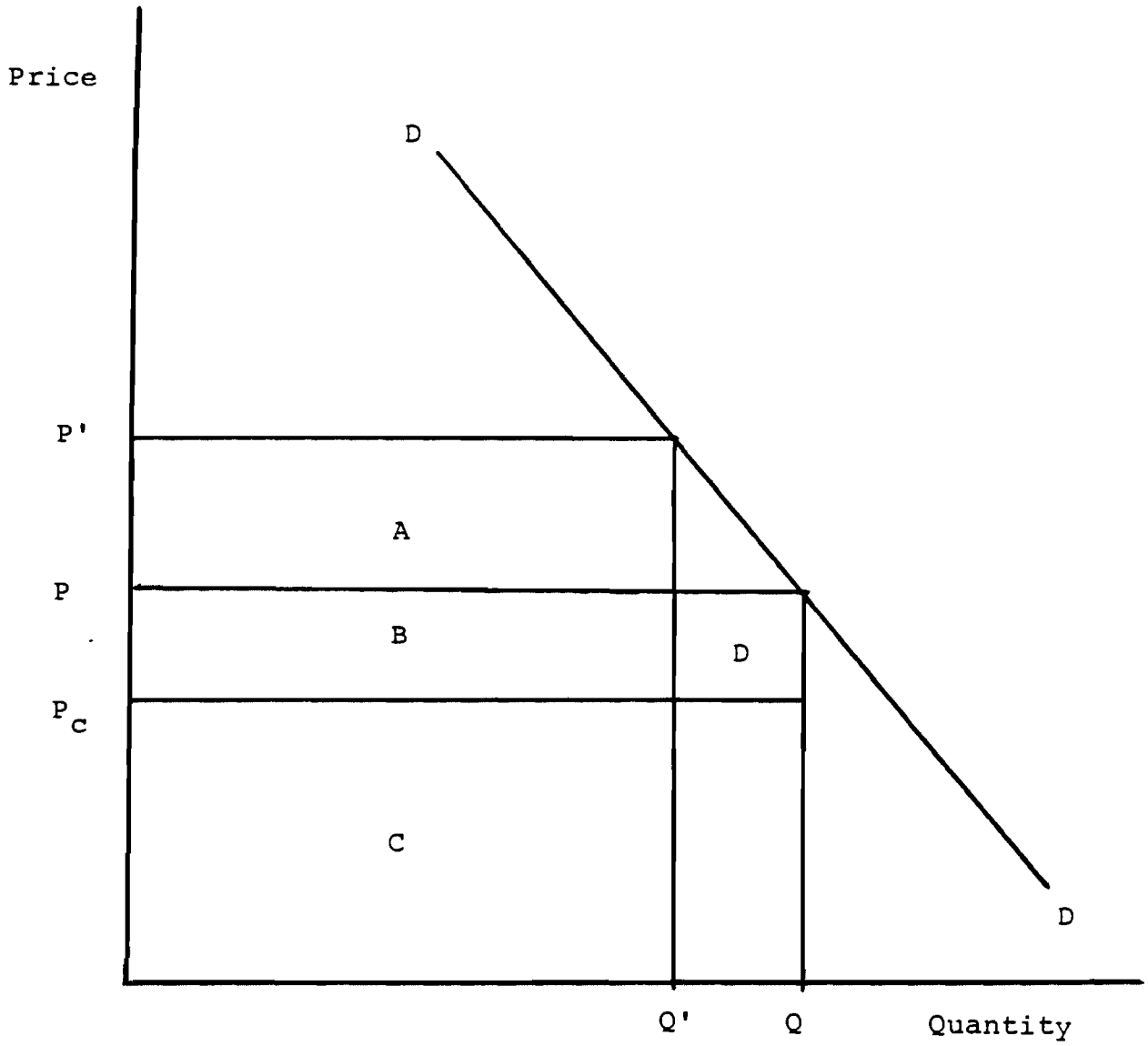

Figure 2: Profit Effects of Price Changes

Table 1. Estimates of Proportional Price Increases

Configuration	R_{ci}	R_{si}	R_{ki}	d	v
1	1.012	1.133	1.374	-.1072	.3576
2	1.019	1.089	1.323	-.0637	.2975
3	1.065	.926	1.257	.1502	.1799
4	1.083	.924	1.260	.1723	.1631
5	1.019	.910	1.161	.1186	.1398
6	1.051	.934	1.187	.1245	.1224
7	1.069	.949	1.372	.1270	.2838
8	1.071	.915	1.323	.1705	.2335
9	1.079	.940	1.276	.1481	.1827
10	1.106	.936	1.285	.1817	.1620
11	1.010	.914	1.158	.1061	.1463
12	1.054	.920	1.197	.1457	.1361
13	.912	.773	1.112	.1785	.2197
14	.937	.953	1.365	-.0170	.4560
15	.999	.776	1.104	.2873	.1057
16	.975	.954	1.363	.0218	.3974
17	1.037	.789	1.136	.3137	.0958
18	.897	.957	1.283	-.0632	.4315
mean	1.022	.927	1.252	.1108*	.2283**

* d > 0 significant at .01 level with $t_{17} = 2.72$

** v > 0 significant at .001 level with $t_{17} = 8.40$

Table 2. Estimates of Effects on Profits

Fiscal Year (Ending 6/30)	Xidex Duplicate Microfilm Sales (000)			Estimates of "Supra-Competitive" Profits (000)	
	Total	Diazo	Vesicular	π'_d	π'_v
1978*	29,282	18,194	11,088	1,818	
1979*	39,736	23,605	16,131	2,358	
1980**	49,596	(29,462)	(20,134)		3,738
1981**	54,802	(32,554)	(22,247)		4,131
Total				4,176	7,869

* Sales data for FY 1978 and 1979 taken from "Xidex Corporate Update," October 1979 (published by Xidex). This document gives sales data separately for diazo and vesicular for FY's 1974-1978.

** Combined sales of diazo and vesicular for FY 1980 and 1981 were taken from Xidex's annual reports (microfilm sales are not broken down by film type). For FY 1980 and 1981 total microfilm sales were allocated between diazo and vesicular using proportions for FY 1979 sales.

Footnotes

1/ The relatively small number of price-concentration vs. profit-concentration cross section studies is due to the paucity of useful data on prices. For examples of the former see R. C. Aspinwall, "Market Structure and Commercial Bank Mortage Interest Rates," Southern Economic Journal 36 (April 1970) 376-84; F. W. Bell and N. B. Murphy, "Impact of Market Structure on the price of a Commercial Banking Service," Review of Economics and Statistics 51 (May 1969) 210-13; A. A. Heggestak and J. J. Mingo, "Prices, Nonprices, and Concentration in Banking," Journal of Money Credit and Banking 8 (February 1976) 107-17; D. Hester, "Customer Relationships and Terms of Loans: Evidence from a Pilot Survey," Journal of Money Credit and Banking 11 (August 1979) 349-57; ; R. M. Lamm, Jr., "Prices and Concentration in the Food Retailing Industry," Journal of Industrial Economics 30 (September 1981) 67-78; J. H. Landon, "The Relation of Market Concentration to Advertising Rates: The Newspaper Industry," Antitrust Bulletin 16 (Spring 1971) 53-100; B. Marion, W. Mueller, R. W. Cotterill, F. Geithman and J. Smelzer, "The Price and Profit Performance of Leading Food Chains," American Journal of Agricultural Economics 61 (August 1979) 420-33; and H. P. Marvel, "Competition and Price Levels in the Retail Gasoline Market," Review of Economics and Statistics 60 (May 1978) 252-58.

2/ Xidex Corp., Doc. No. 9146, Complaint Counsel's Trial Brief, May 4, 1981 (hereinafter, Trial Brief), at 13 ff. The duplicating

process starts with a master negative (of a paper document or an image on a CRT screen) made using silver halide "original" microfilm. Diazo and vesicular cannot be used for this step because they lack the light sensitivity need to form an image from reflected light. From original, duplicate copies are made -- using diazo, vesicular, or silver duplicating film -- by directing a high intensity light source through the original (which serves as a template) onto the duplicate film. In the case of vesicular, the latent image is created by a photochemical reaction which releases minute amounts of nitrogen gas which is trapped in the film coating. When heat is applied, the gas expands creating microscopic bubbles (vesicules). These bubbles diffract light to create a dark image where the film was exposed to light. Thus vesicular copies reverse the photographic sign of the document (the film preserves the sign of the negative). In the case of diazo, the image is created by a different photochemical reaction which in the presence of heat and ammonia prevents the formation of a dye where the diazo film has been exposed to light; the unexposed areas develop dark. This film preserves the sign of the original document (reverses the sign of the negative.)

3/ Id. at 14. The cost advantage of non-silver films is due to both the lower cost of the film itself and the simplicity of processing. Silver films require a series of chemical baths to develop the latent image. In contrast vesicular film requires only the application of heat while diazo requires heat and ammonia.

4/ Id. at 16. Diazo and vesicular have almost entirely displaced silver duplicating film in uses other than making copies for archival storage. The continuing use of silver film in this application is influenced by official archival certification of silver film.

5/ Id. at 18-23. The most important factor limiting short-run substitutability between the two is that duplicating equipment is specialized to accommodate one or the other. In addition to price, the choice of diazo vs. vesicular is influenced by differences in film characteristics and the developing process. Other things equal a microfilm copy with a dark background and light text is preferred because it reduces eye fatigue, so the photographic sign of source material is a consideration in the choosing a duplicating film. Vesicular reverses the photographic sign of the original document, while diazo preserves the sign. (See note 2) Diazo requires heat and ammonia to develop the image while vesicular requires only heat. Vesicular thus has the advantage of not requiring special venting and other precautions necessary when working with and storing ammonia. On the other hand, the resolution of diazo is less affected by dust particles.

6/ Id. at 28, 32 and 33.

7/ Xidex Corp., Doc. No. 9146, Trial Transcript (hereinafter, Trial Transcript) at 58 (testimony of Joseph C. D' Annunzio, President of Teledyne Post)

8/ Trial Transcript at 60-61 (testimony of Joseph C. D' Annunzio, President of Teledyne Post: regarding increases in cost of

materials and offsetting productivity gains) and "Xidex: Corporate Update," October 1979 (published by Xidex).

9/ The same coating equipment can be used to coat either type of film. Trial Transcript at 233 and 252 (testimony of James D. Trotter, President of Consolidated Micrographics), 363 (testimony of Frank Scarpone, former general sales manager of GAF Micrographics), 363 (testimony of Dr. Norman Notley, consulstant to 3M corporation), and 1150 (testimony of Karl Kraske, Vice President of James River Graphics). Although the manufacturing processes are very similar, production substitution is hampered by the web of patents and trade secrets surrounding vesicular coating formulations. There are three such formulations in use. With its acquisition of Kalvar, Xidex controlled two. The third has yet to capture any significant portion of the market. Patent protection on diazo coating formulations expired before the time period examined in our study. However, even absent patent protection on coatings, entry into film coating, whether diazo or vesicular, appears to be difficult due to learning curve effects. Production on a commercial scale requires skills acquired by trial and error and is not easily transferable. Several potential entrants into film coating gave up in frustration following unsuccessful attempts to produce microfilm using methods which seemed promising in the laboratory. Trial Transcript at 344-51 (testimony of Dr. Norman T. Knotley: concerning patents as a barrier to entry in vesicular); 714-23 (testimony of Richard A. Bearse, President of Arkwright: history of Arkwright's unsuccessful attempt to enter into manufacture of diazo).

10/ General Services Administration, Federal Supply Service, Federal Supply Schedule FSC 67 Part IV, Section A (Micrographic Supplies).

11/ General Services Administration, Federal Supply Service, Abstract of Bids (Available for contract years 1977-78 through 1980-81.)

12/ Each configurations may contain more than one GSA product "item", so there may be more than one low bid in that configuration.

13/ Trial Transcript at 233 (testimony of James D. Trotter, President of Consolidated Micrographics).

14/ Trial Transcript at 198 (testimony of James D. Trotter, President of Consolidated Micrographics: GSA prices considered best index of market prices) and 508-9 (testimony of Vernel O. Fosse, Program Manager for Microcopying, Micrographics Division, 3M: GSA prices best index of duplicating microfilm prices).

15/ Bids for contract year 1979-80 were submitted on February 26, 1979. The purchase agreement between Xidex and Kalvar was reached on February 14, 1979 (effective March 22). (Trial Brief at 8.) The circumstances regarding the contract awards for 1979-80 are unusual. Kalvar was the low bidder on most vesicular products. Xidex was typically the next to the lowest bidder, but with prices that were substantially higher than those bid by Kalvar. One would think that, in acquiring Kalvar, Xidex would

have incurred the obligation to fulfill Kalvar's contracts at the prices tendered by Kalvar. (Apparently GSA contract officers were of this opinion as there is a series of legal memoranda in GSA files concerning a dispute on this issue, but no record regarding its final disposition.) However, when the 1979-80 supply schedule was published, Xidex was listed as the supplier on all contracts on which Kalvar had been the low bidder, and the final contract prices were those that had been tendered by Xidex.

16/ The average values of R_{ci}, R_{si}, and R_{ki} do not correspond exactly to the unweighted mean of the average annual values of (V/D) in the corresponding subperiod. In some contract years, the price ratio for some configurations could not be calculated because there was no contract award for one of the two products.

17/ See O. E. Williamson, "Economies as an Antitrust Defense: The Welfare Tradeoffs," American Economic Review 58 (March 1968) 18-36. At least in the case of the Kalvar acquisition, there is a strong presumption that there was no efficiency gain from the merger. Two months after the acquisition, the plant was closed and the employees were fired. (Trial Brief at 9.)

18/ If P and Q were used the result obtained below in (11) would have to be multiplied by Q'/Q, which would make the estimate of D/A smaller. Using P' and Q' has the opposite effect on D/A.

19/ Xidex acquired the duplicate microfilm business of Scott Graphics (including a production facility) for $4,225,000 in cash and notes. (Trial Brief at 7.) Xidex paid Kalvar $1,776,000 in

cash and assumed, or agreed to reimburse Kalvar for, virtually all of its liabilities, totaling $4,253,892. Xidex received Kalvar's physical assets, accounts receivable, patents and trade secrets, copyrights and trade names, and an agreement not to compete in the duplicate microfilm business for five years. Kalvar retained its corporate identity, cash and tax loss carry-forwards. (Trial Brief at 9.)

20/ Federal Trade Commission Decision and Order, Doc. No. 9146