CASE STUDIES OF THE PRICE EFFECTS OF HORIZONTAL MERGERS

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Case Studies of the Price Effects of Horizontal Mergers

by

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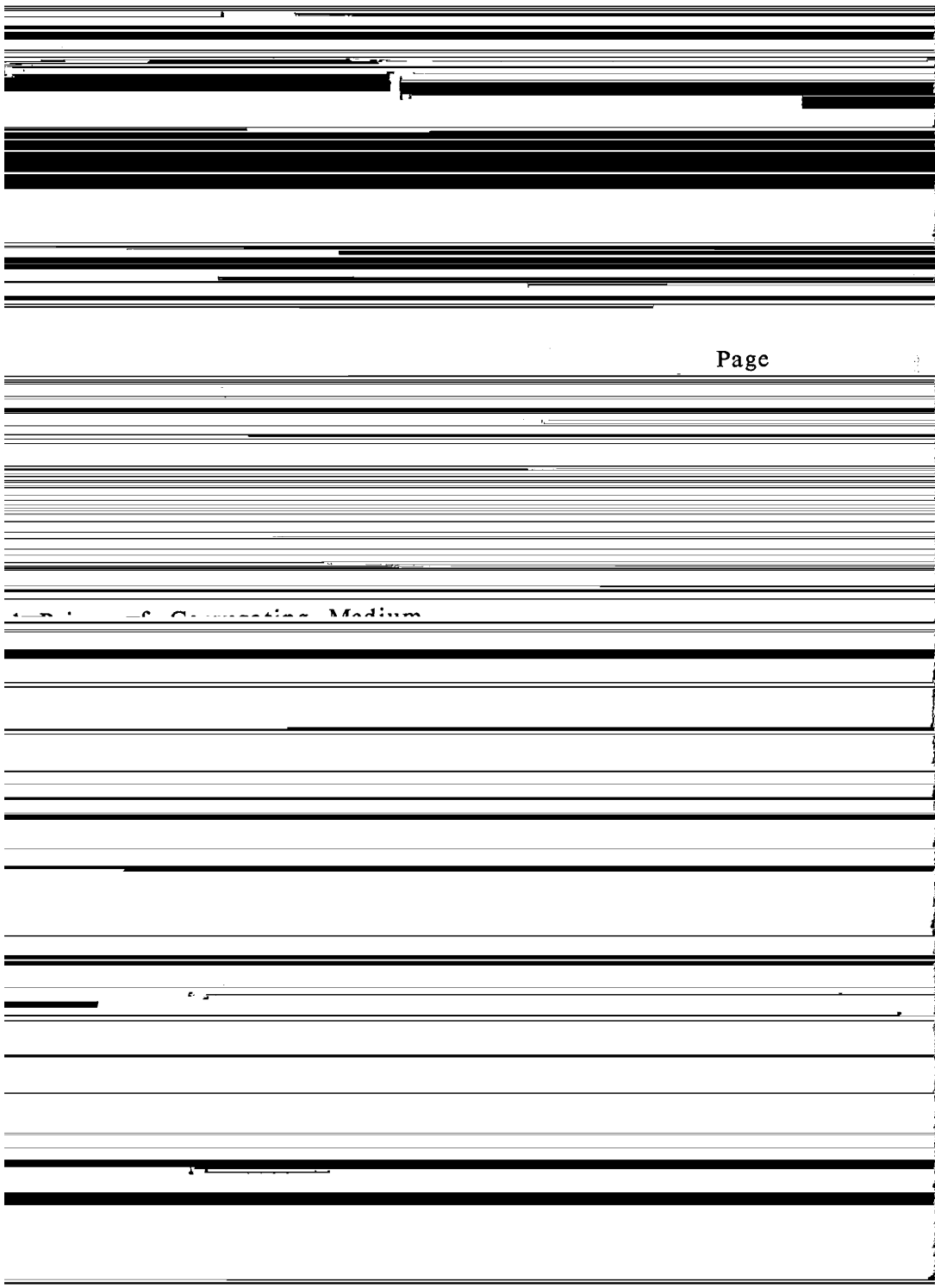


Figure III.2 Real Prices of Corrugated Boxes 1976 -

effects of horizontal mergers on product prices. As a collection of case studies, the research is not intended to offer

and the hold-separate order was lifted.

fraction of Hawaiian cement sales in the two years immediately preceding the acquisition. Moreover, cement sales in Hawaii had declined substantially in the years

The study finds no persuasive evidence that the creation of Lone Star Hawaii increased the price of cement in Hawaii. In fact, once Japanese demand and supply factors (that implicitly control for imports) are included in the

we also control for).[2] Nor can the price increase be explained by other domestic mergers.[3] Our results also suggest that

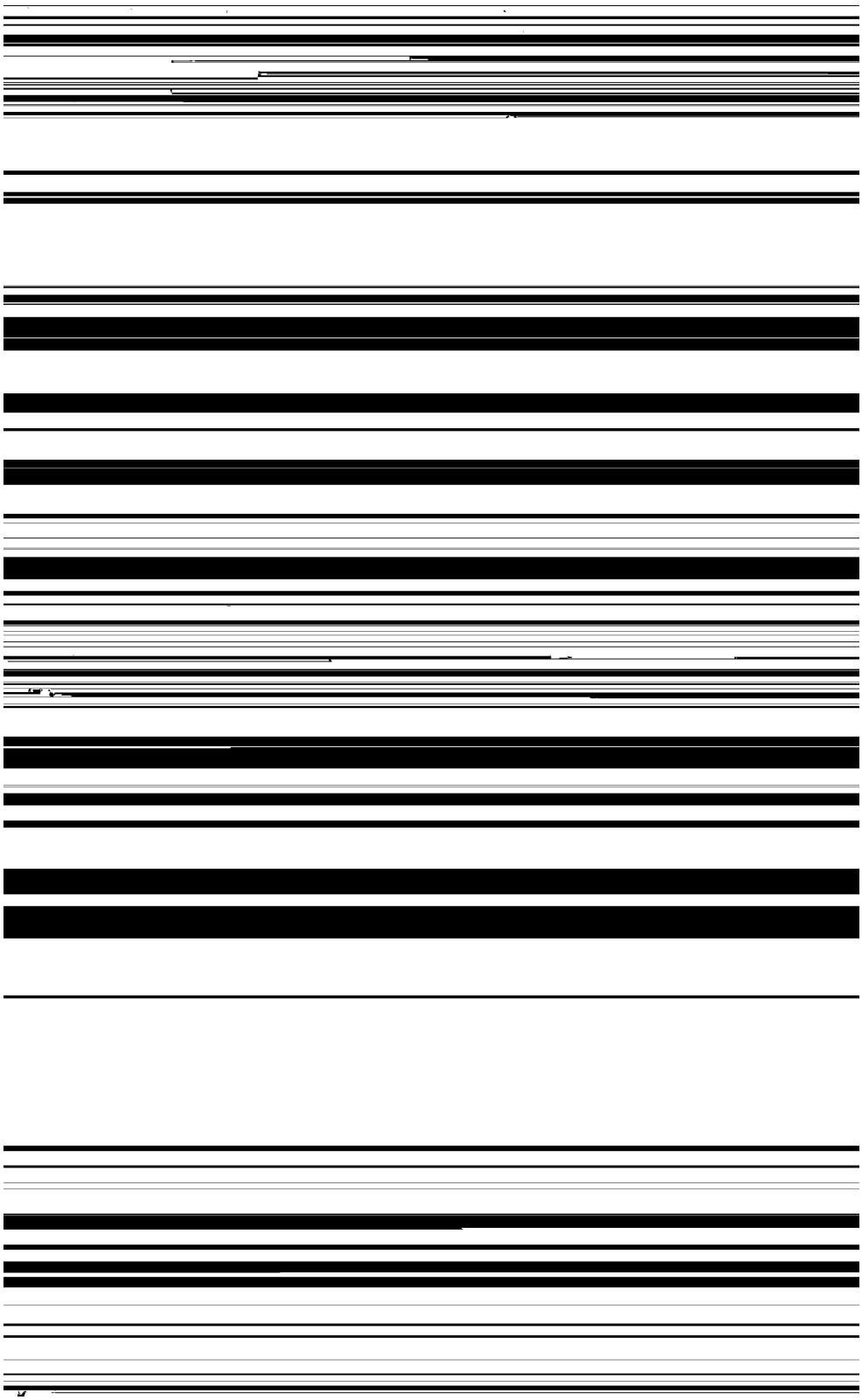
[redacted]

I. Introduction

In recent years economists have seen a resurgence of

exceptions are Barton and Sherman (1984), which examined the effects of two mergers in the microfilm industry on price

the FTC complaint alleged that the acquisition would likely lessen competition in the market for corrugating medium in the region west of the Rocky Mountains. One obvious issue of



II. Methods

The purpose of this study is to measure the effect of horizontal mergers on market prices. To do so, we use a

supply variables to price.

In perfectly competitive and monopolistic markets, the determination of price is straightforward; however, most industries are neither perfectly competitive nor monopolistic. Models that examine the determination of price in such oligopolistic markets often feature substantial theoretical

To develop our reduced-form price equation, we begin

$$Q = \alpha P^{-\varepsilon} D^{\beta} e^{\mu}, \qquad \text{(II.1)}$$

where Q is the quantity demanded in a given time period, P is the price of the product during that time period, D is a vector $(d_1, d_2, \ldots, d_n)$ of n exogenous factors affecting demand, e is the natural exponential constant, μ is a log-normal random

Next, we assume a homogeneous industry-wide production function. Such a production function implies that industry costs are of the form

technology. From this relationship, we can derive a marginal

$$= \eta k Q^{\eta-1} c(\pi). \qquad \text{(II.4)}$$

We combine the industry demand and cost equations assuming that the firms in an industry seek to maximize

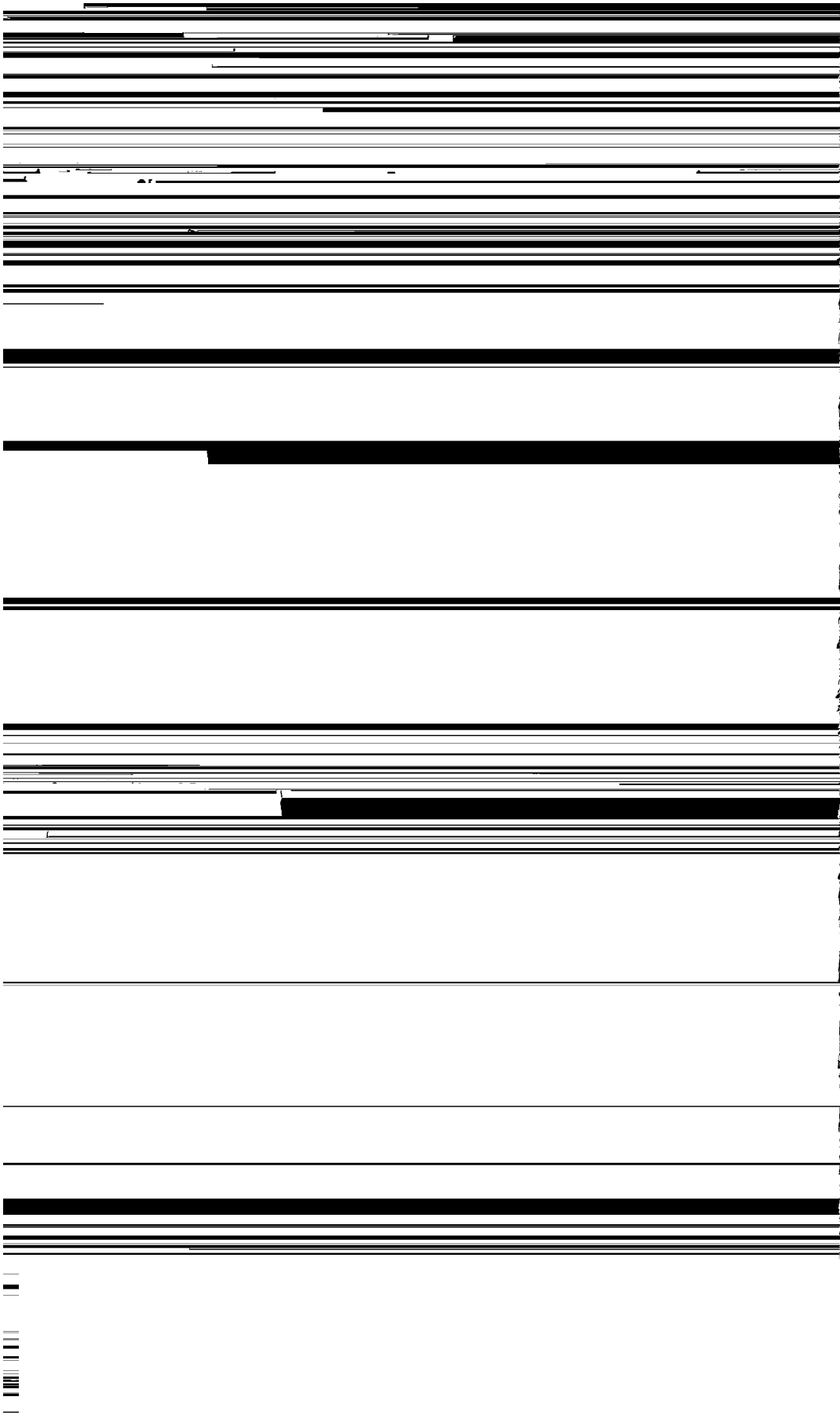
us

$$\ell nP = \ell nm + \ell nk + \ell n\eta + (\eta-1)\ell nQ + \ell nc(\pi) + \nu. \qquad (II.6)$$

variables during the period following the merger (i.e., the period in which DM equals one).

[redacted]

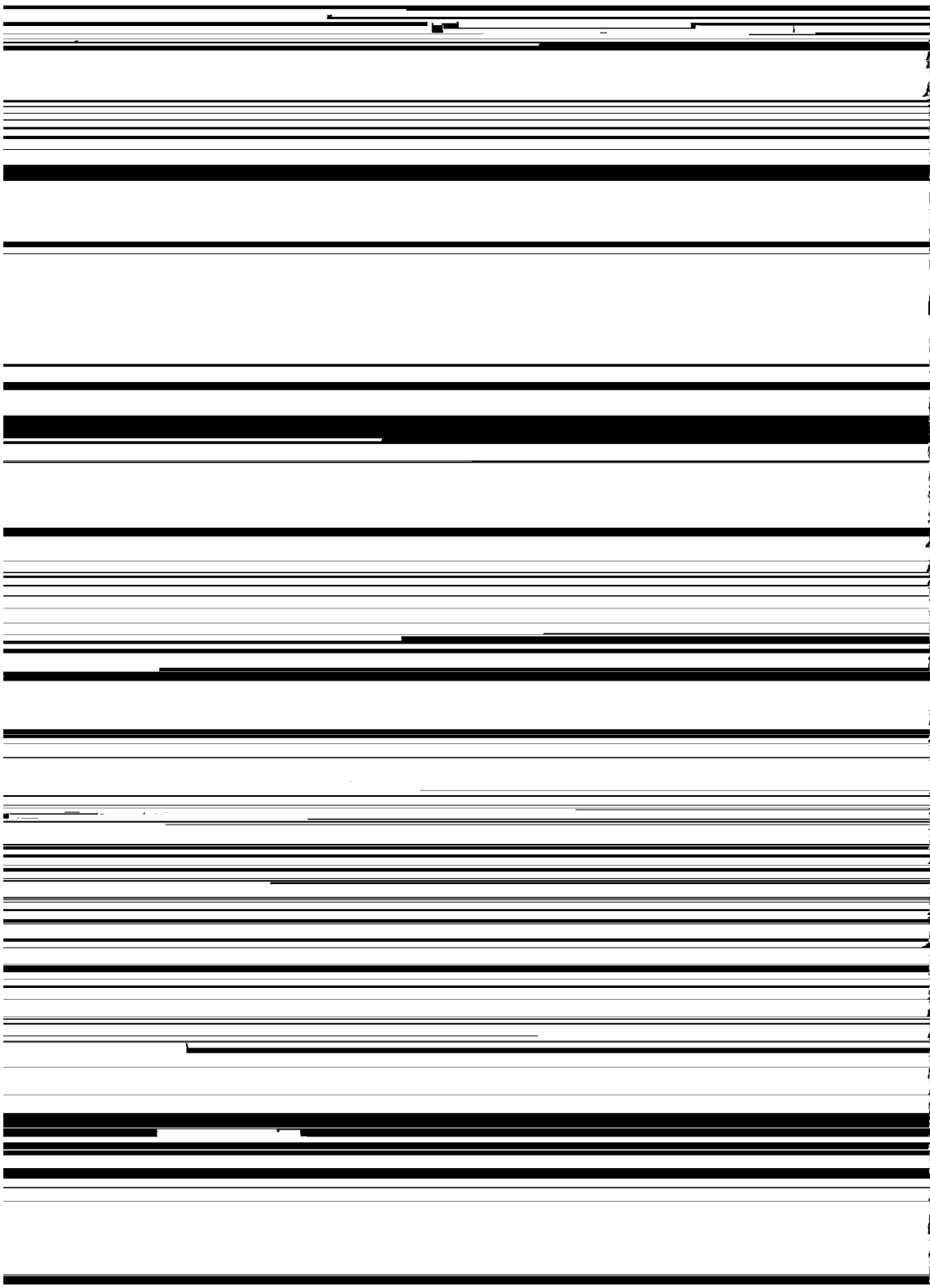
that alter market structure. We adopt this approach for examining changes in industry pricing behavior over time,



[redacted]

On February 9, 1981 the FTC issued an administrative

[redacted]



There are a number of interesting issues raised by hold-separate orders in general and the Weyerhaeuser/Menasha hold separate order in particular. As

order may have created incentives for those who did control

Given the relationship between medium and boxes, an important force motivating the purchase may have been the

quarter of 1988, the period in which Weyerhaeuser had complete control over the North Bend corrugating medium plant.

The demand for corrugating medium is derived from the demand for corrugated boxes. Corrugated boxes are used

to ship such diverse products as canned and bottled goods, agricultural products, clothing, appliances, toys, drugs, books, and furniture (to name just a few). Thus, the demand for

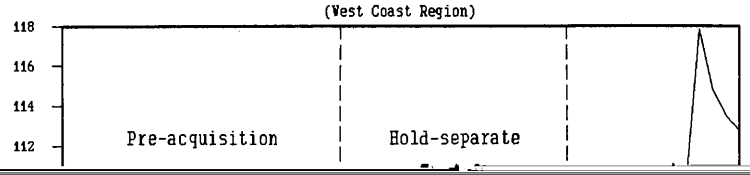
Table III.1

Variable Descriptions For Price Equations[1]

Variable	
PCMW	Dependent variable: average real price index of corrugated medium, western United States[2]
C	Constant
LPOWER	Log of real industrial power price index, average for west coast states[2]
LW26	Log of real wage index, SIC 26, western U.S.[3]

REAL PRICES OF CORRUGATING MEDIUM 1976 - 1988

(West Coast Region)



C. Results

[redacted]

(t-statistics in parentheses)

Variable	Corrugating Medium	Corrugated Bo
C	1.1306** (2.3820)	1.3999** (7.0130)
LPOWER	-0.1281* (-1.7425)	-0.0979 (-1.0352)
LW26	0.1395**	-0.0810

Table III.2 - Continued

Reduced-Form Price Equations

Variable	Corrugating Medium	Corrugated Boxes
LPOWER*DUM85	-0.0465 (-0.2023)	-0.01383 (-0.1341)
LW26*DUM85	1.2822 (0.9561)	1.0346 (1.6712)
LNAOH*DUM85	0.5561 (1.3318)	0.2447 (1.2429)
[illegible]	[illegible]	[illegible]
LCHIPW*DUM85	-0.2351 (-0.7160)	-0.2337 (-1.3929)
LDISC*DUM85	-1.1020** (-2.1222)	-0.5893** (-2.4414)
LPYW*DUM85	0.8859 (1.6235)	-0.3579 (-1.4351)
DUM81	0.1544 (0.0933)	-2.5124** (-3.2709)
DUM85	1.1953 (0.3405)	2.6274 (1.6171)

Table III.3

Price Effects of the Imposition

and Removal of the Hold-Separate Order

(t-statistics in parentheses)

Difference Quotient	Corrugating Medium	Corru
$\Delta \ln P/\Delta DUM81$	0.1576**	-0.0
	(2.5528)	(-1.1
$\Delta \ln P/\Delta DUM85$	-0.1391**	-0.0
$(\Delta \ln P/\Delta DUM81)+(\Delta \ln P/\Delta DUM85)$	0.0185	-0.1
	(0.2929)	(-2.5

*Significant at 0.10 level

after consummation of the merger under the hold-separate order.[25]

$\Delta \ell nP/\Delta DUM85$ measures the effect on medium prices of the dismissal of the antitrust case against Weyerhaeuser

$$\Delta \ell nP/\Delta DUM85 = 1.195 - 0.047*LPOWER + 1.282*LW26 +$$

separate order, however, resulted in a price decline of approximately 13 percent. This result is consistent with the proposition discussed above that the hold-separate order may have been a poor remedy. By allowing Weyerhaeuser to acquire the North Bend mill, the hold-separate order may have allowed any potential anticompetitive effects of the acquisition to be realized by creating a strong incentive for the management of the mill to pursue the best interests of Weyerhaeuser. On the other hand, by preventing Weyerhaeuser from receiving preferential distribution of the North Bend mill's output, the hold-separate order may have prevented the realization of vertical efficiencies that ultimately lowered the cost of corrugating medium after the

post-merger quarters. These difference quotients and their

As indicated in Table III.4, 28 of the 31 values of $\Delta \ell nP/\Delta DUM81$ are positive, and the three negative values are small and statistically insignificant. Of the 28 positive values of $\Delta \ell nP/\Delta DUM81$, 16 are statistically significant at less than the .05 level and three are statistically significant at less than the .10 level. Further, 22 of the difference quotients exceed

Table III.4

Effects on Corrugating Medium Prices of the Imposition

and Removal of the Hold-Separate Order

Evaluated at Values of the Exogenous Variables For Each Post-Merger Quarter

	Quarter	ΔlnP/ΔDUM81	t-stat	ΔlnP/ΔDUM85	t-stat	Sum	t-stat
1.	1981:Q2	0.1108	1.4972	-0.0203	-0.4320	0.0905	1.1691
2.	1981:Q3	0.0864	0.6234	-0.0697	-0.3935	0.0167	0.3237

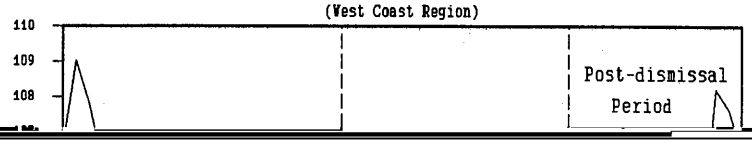
[redacted]

5 1982:Q2 -0.0080 -0.1879 -0.0453 -1.4181 -0.0533 -1.2122

suspension of the hold-separate order upon dismissal of the antitrust complaint resulted in a significant decrease in

REAL PRICES OF CORRUGATED BOXES 1976 - 1988

(West Coast Region)



The effect on the price of corrugated boxes of Weyerhaeuser's purchase of the North Bend corrugating medium plant under the hold separate-order is

[redacted]

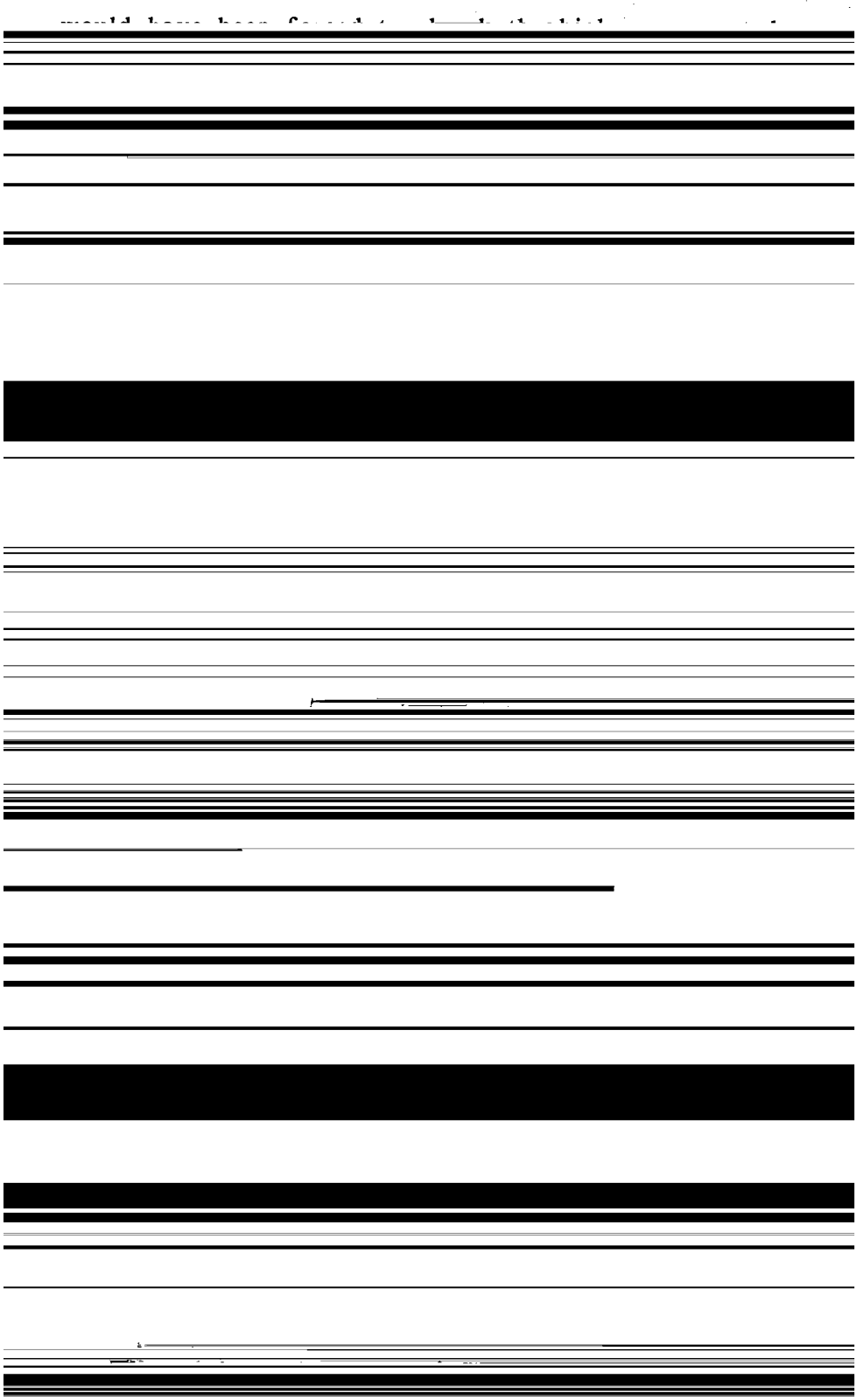
0.151*LDISC + 1.243*LPYW.

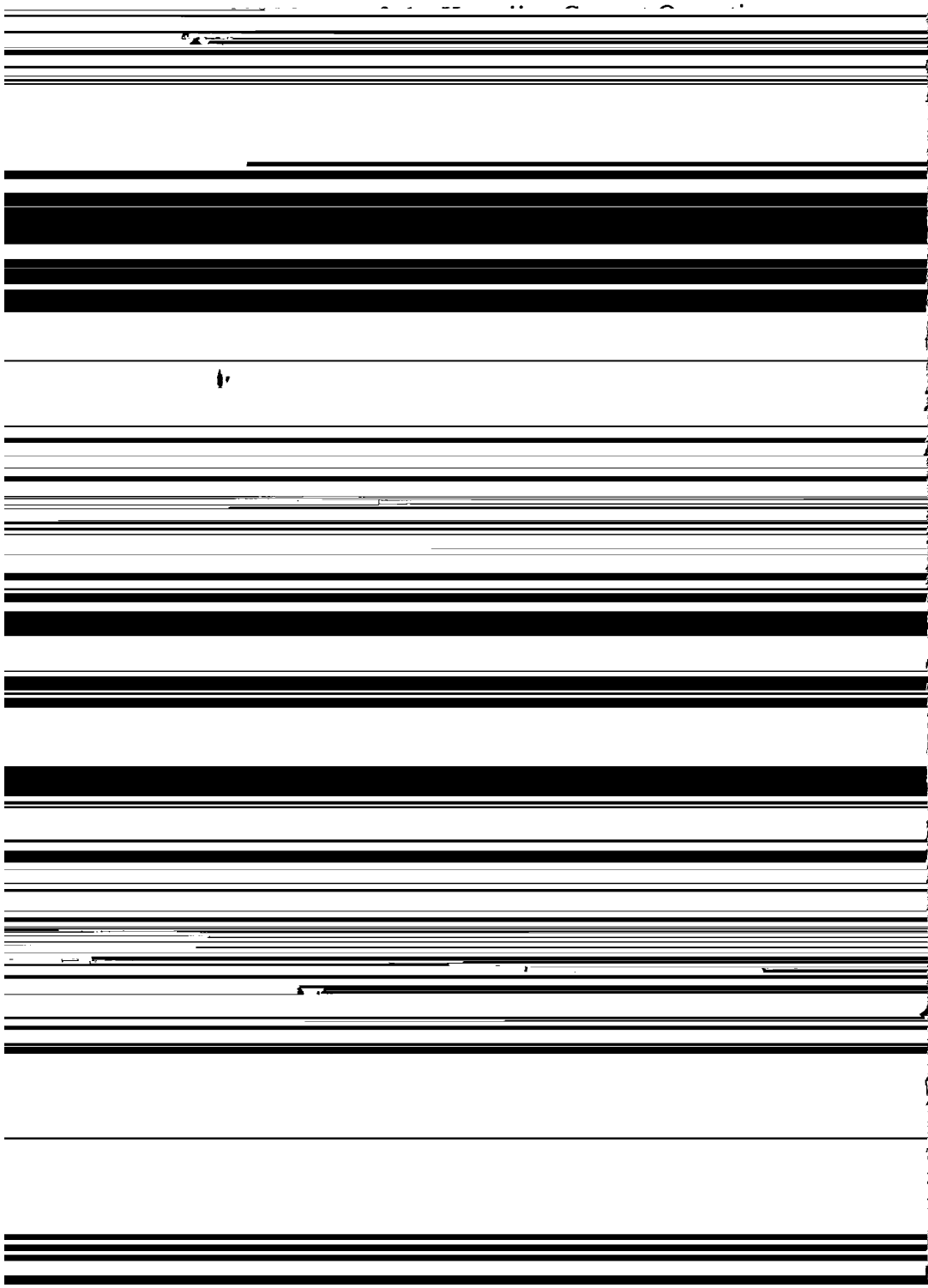
As indicated in Table III.3, the value of this difference

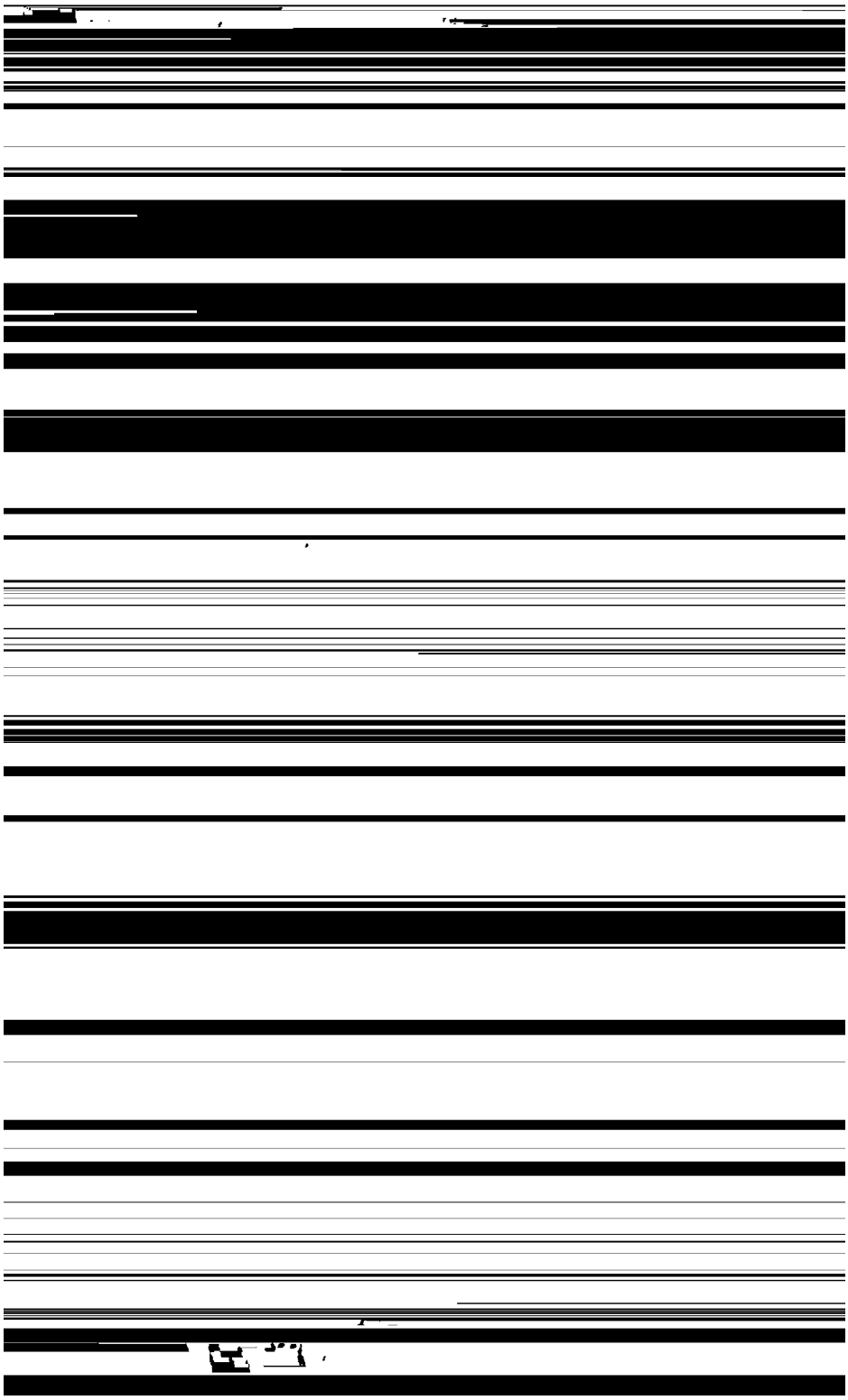
Table III.5

Effects on Corrugated Box Prices of the Imposition and Removal of the Hold-Separate Order

	Quarter	ΔlnP/ΔDUM81	t-stat	ΔlnP/ΔDUM85	t-stat	Sum	t-stat
1.	1981:Q2	-0.1166	-2.7386	-0.1064	-2.3006	-0.2230	-4.1363
2.	1981:Q3	-0.1479	-3.1494	-0.0765	-1.4039	-0.2244	-2.7562







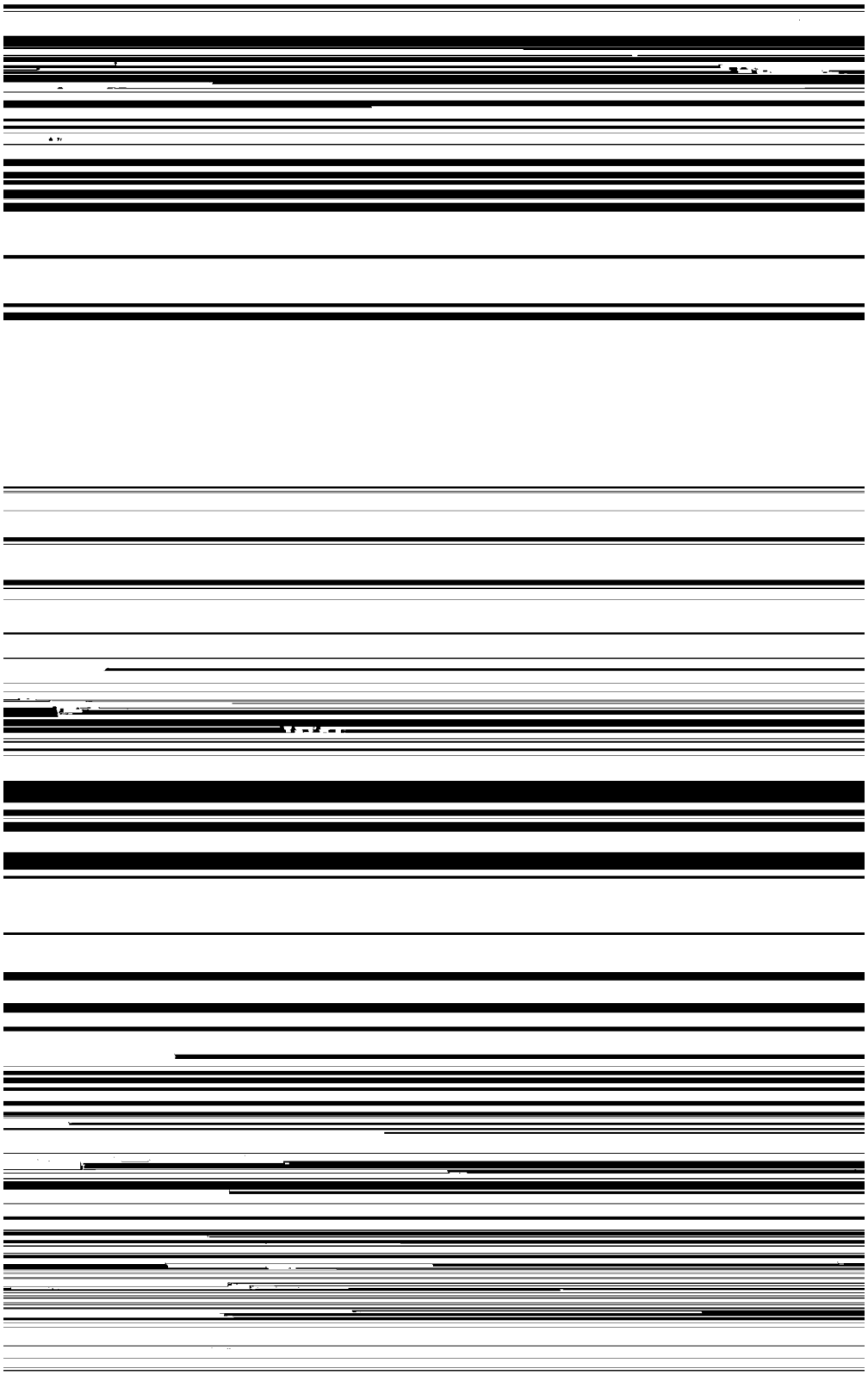
very specific forms. That the merger would not affect η implies that technical change is "Hicks neutral." That is, the marginal rates of technical substitution of inputs are the same both before and after the merger. That the merger would not affect the c_i's (the elasticities of cost with respect to input prices) implies that technical change created by the merger is

[redacted]

optimal ratios of inputs are unaffected by the merger.

[redacted]

substitutes for cement produced by Hawaiian firms. Among



Japan was the largest (and for much of the period, the sole) exporter of cement to Hawaii.[34] Thus, variables affecting

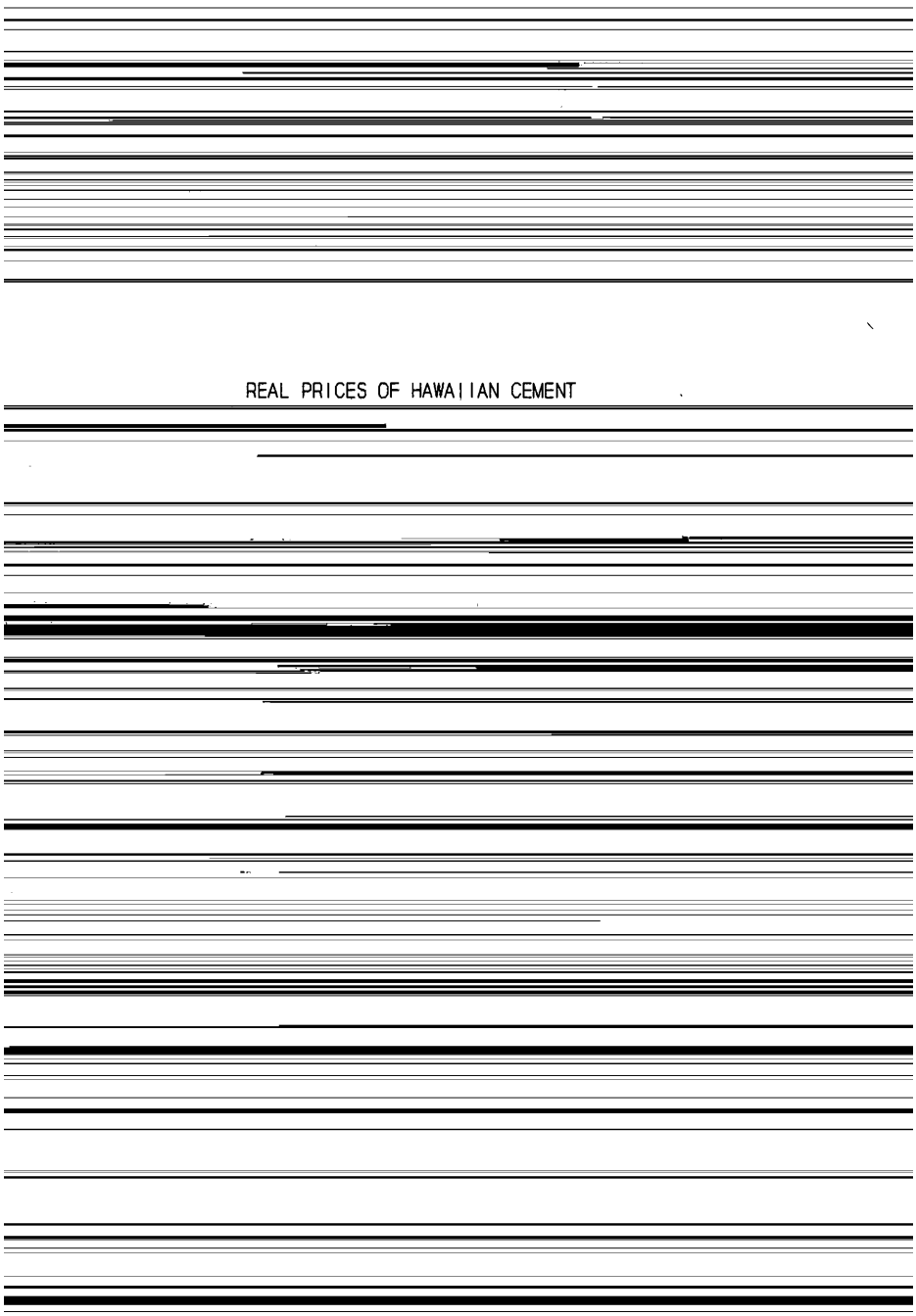

REAL PRICES OF HAWAIIAN CEMENT

Table IV.2

Hawaiian Cement Imports

1962	0.4	0.2%
1963	0.2	0.1
1964	0.1	0.1
1965	0.4	0.1
1966	0.6	0.2
1967	0.6	0.2
1968	0.4	0.1
1969	72.0	15.6
1970	45.5	10.3
1971	15.6	4.0
1972	1.0	0.2
1973	1.0	0.2
1974	16.0	3.2
1975	28.0	5.8
1976	6.0	1.8
1977	0.0	0.0
1978	0.0	0.0
1979	0.0	0.0
1980	23.0	6.0
1981	0.0	0.0
1982	0.0	0.0
1983	37.0	14.6

the merger and fell precipitously in 1985, the year of the merger. Since 1985, Hawaiian cement prices have remained well below their immediate pre-merger levels.

Table IV-2 lists imports of cement into Hawaii and

and demand variables.[38] This decrease in price is significant

indicates that the average 1986-1987 price of Hawaiian

level in Specification IV.1, and positive and significant at the .10 level in Specification IV.2; however, in Specification IV.2 this derivative is greater than 1. The derivatives with respect

view that in markets in which imports are easily accessible, imports may have an important impact on price following a merger even if they have not played an important role for an extended period prior to the merger.

Table IV.4

[redacted]

rutile ore.[43]

Although unexpected shortages of rutile are developed

Chloride capacity steadily replaced sulfate capacity as older sulfate plants were retired. Although there were individual years where total capacity fell due to the closing of one or more sulfate plants, newer, lower-cost chloride capacity

of firms manufacturing TiO_2 in the U.S. and the high market concentration in domestic sales of TiO_2, the merger was not challenged by federal antitrust authorities.[45] Yet, little

Gulf & Western plant approximately one year after the acquisition.

[redacted]

[redacted]***

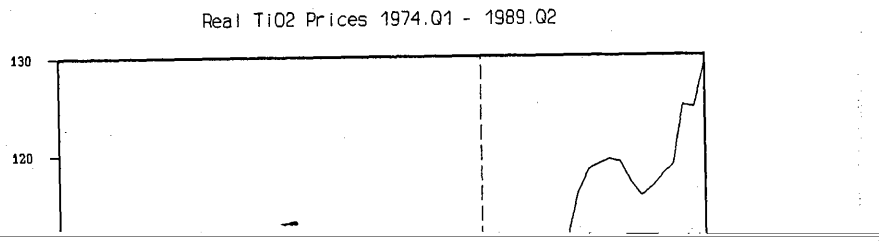
[redacted]

Variable	
LTIO2	Dependent variable: Log of deflated TiO_2 price index**
[redacted]	
LPAINT	Log of paint production index (SIC 2851)*
LPLASTIC	Log of plastic production index (SIC 2821)*
LPAPER	Log of paper production index (SIC 2600)*
[redacted]	[redacted] (SIC 281[redacted] Inorganic Chemicals)**

[redacted]

As discussed above, TiO_2 is manufactured by two

8% of total materials cost in the production of paint. To avoid possible simultaneity bias, we replaced the log of the paint production index, LPAINT, in our reduced-form price


Real TiO2 Prices 1974.Q1 - 1989.Q2
130
120

C. Empirical Results

Specification V.1 in Table V.2 reports the results from the estimation of the reduced-form price equation. DUM84 is

Table V.2

Dependent Variable: Log of Deflated TiO_2 Price Index
(t-statistics in parentheses)

Variable	Specification V.1	Specification V.2
C	3.0196	1.3352
	(1.5889)	(0.6007)
LPAINT‡	0.1311	0.1001
	(0.7274)	(0.4675)
LPLASTIC	0.5224	1.1001**
	[illegible]	[illegible]
LPAPER	-0.8750	-1.6112**
	(-1.2583)	(-2.0929)
	(0.2346)	(-0.4188)
LCHL	0.3537	0.6153
	(0.7704)	(1.2155)
LPOWER	0.5857	0.7920
	(0.5983)	(0.7804)
LSULFUR	0.0232	-0.6209
	(0.0302)	(-0.6787)
LRXA	-0.8910**	-0.3662
	(-2.3717)	(-0.7683)

Table V.2 -- Continued

LW281*DUM84	0.2936 (0.1983)	-5.3058 (-1.5944)
LCHL*DUM84	-0.0878	3.3674*

Table V.2 -- Continued

Dependent Variable: Log of Deflated TiO_2 Price Index
(t-statistics in parentheses)

LRXG*TIME	-0.0086 (-0.5653)	-0.0205 (-1.1387)
LRXC*TIME	-0.0558* (-2.1008)	-0.0754** (-2.5882)

Table V.3

Price Effect of SCM's Purchase of Gulf & Western's

(t-statistics in parentheses)

ΔlnP/ΔDUM84
0.3187*
(1.8979)

on the values of the exogenous variables used to evaluate them. We believe that the average values of the exogenous variables during the post-merger period are reasonable values

[redacted]

are reported in Table V.4, and they suggest that the merger altered the process determining TiO_2 prices so as to increase

Table V.4

Price Effect of SCM's Purchase of Gulf & Western's
Titanium Dioxide Facilities: Specification V.1
Evaluated at Actual Post-Merger Values of the Exogenous Variables

	Quarter	ΔlnP/ΔDUM84	t-statistic	
1.	1984:Q2	0.0463	0.8563	
2.	1984:Q3	0.1665		2.4198
3.	[illegible]	[illegible]	[illegible]	
4.	1985:Q1	0.2473	2.3024	

Table V.5

Price Effect of SCM's Purchase of Gulf & Western's

	ΔmP/ΔDUM84
	0.2495**
	(2.1643)

capacity "crunch."[58]

To test the robustness of $\Delta \ell nP/\Delta DUM84$ evaluated at post-merger average values of the exogenous variables, we calculated its value using the actual values of the exogenous variables for each quarter over the 1984:Q1 - 1987:Q2 period. These 14 values of $\Delta \ell nP/\Delta DUM84$ and their t-statistics are

all 14 are positive. Eight of the 14 values of $\Delta \ell nP/\Delta DUM84$ exceed 0.20, and 12 exceed 0.15. Nine of the 14 t-statistics

Table V.6

of Gulf & Western's TiO_2 production facilities.[59]

A price increase of over 28% following a particular merger seems remarkably large. One would expect that such a large increase in prices would result in striking increases in profits. TiO_2, however, is produced by relatively large, [redacted]

Report, "Titanium dioxide pigments achieved record levels of operating income" in 1985. In each subsequent year through 1989, the earnings of Kerr-McGee's chemical division

VI. Summary and Conclusions

[redacted]

The results from this study show that the messag

Hawaii. In fact, once Japanese factors affecting the residual demand curve faced by Hawaiian producers (which implicitly control for imports) are included in the model, we find a large

this acquisition, will not necessarily prevent post-merger price increases when mergers take place in highly concentrated industries. Consequently, we conclude that the evidence is

Baker, J. and T. F. Bresnahan, "The Gains from Merger and Collusion in Product Differentiated Industries," The Journal of Industrial Economics, XXIII (1985), pp. 427-443.

Barton, D. M. and R. Sherman, "The Price and Profit Effects of Horizontal Mergers: A Case Study," The Journal of