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8 The Social Costs of Regulation and Lack of Competition in Sweden: A Summary

Stefan Fölster and Sam Peltzman

8.1 Introduction

Sweden is a "high-price" country. This seems evident to the casual visitor, and it is confirmed by more systematic evidence. For example, table 8.1 shows that, even after the 20 percent depreciation of the krona in 1992, Swedish consumer prices remain higher than in most developed countries. Moreover, available data indicate that Sweden's high-price status goes back at least to the late 1960s (Lipsey and Swedenborg 1993), a period encompassing considerable exchange rate fluctuations. These high prices cannot be entirely explained by Sweden's income level (see fig. 8.1) or by its high indirect taxes (Lipsey and Swedenborg 1993). In this paper, we will try to assess the contribution of Swedish competition and regulatory policy to these high prices.

To an outsider, especially an American conditioned by that country's antitrust laws, Swedish policy on competition has been remarkably lax. Until June 1993, cartel agreements were legal in Sweden. While they could not be enforced in the courts, firms were free to enter into essentially the whole range of agreements—price fixing, sharing of markets, allocation of retail outlets among manufacturers, etc.—that are per se violations subject to criminal penalties under American law. Only resale price maintenance agreements and joint tendering on public contracts were prohibited. Cartel agreements had to be publicly registered on request from the SPK (Swedish National Price and Cartel Board). In principle, agreements could be struck down if found to be against the public interest. However, the (1946) legislation establishing the cartel register put few sanctions at the government's disposal, and, in spite of successive strengthening of the government's powers (1953, 1956, 1982), cartel

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Table 8.1 **Relative Consumer Prices at Current Exchange Rates, Index Sweden = 100**

Countries	October 1992	May 1993	September 1993
Japan	91	128	145
Switzerland	94	112	127
Norway	95	109	117
Denmark	91	108	112
Iceland	91	105	109
Germany (W)	76	91	101
Sweden	100	100	100
Austria	74	89	99
Finland	79	88	92
Netherlands	70	83	92
Belgium	71	85	91
France	71	85	91
Canada	59	71	79
United States	55	74	79
Spain	61	69	76
Ireland	65	71	75
England	57	68	75
Italy	61	70	74
Australia	55	68	71
New Zealand	47	60	67
Greece	54	65	67
Portugal	50	58	60

agreements were largely unrestrained until 1993. In 1992, there were 1,250 agreements in the cartel register. As of 1989, about 15 percent of total sales of goods and services in Sweden were found to be affected by horizontal cartel agreements (SPK 1992). Of these sales, around 55 percent were affected by price-fixing agreements, 15 percent by market-sharing agreements, 15 percent by combined price-fixing and market-sharing agreements, and the remainder by other forms of horizontal cartel agreements.[1]

In principle, these cartel agreements are constrained by exposure to international competition. However, as shown in table 8.2, a considerable share of Swedish output does not face import competition. In this sense, the outsider's view of Sweden as the quintessential "small, open economy" is exaggerated. Table 8.2 also shows that a considerable share of Swedish output is sheltered from competition by regulation, cartel restrictions, or subsidies.

In 1993, Sweden's law on competition was changed to bring it in line with EC rules. The overriding objective is to widen the applicability of the per se

1. The SPK and another authority, the competition commissioner (SKA, established in 1982), also investigated restrictive business practices. In principle, the SKA could prosecute practices that injured competition in a market court. In practice, however, most cases were settled by negotiation; 1 or 2 percent were referred to the market court.

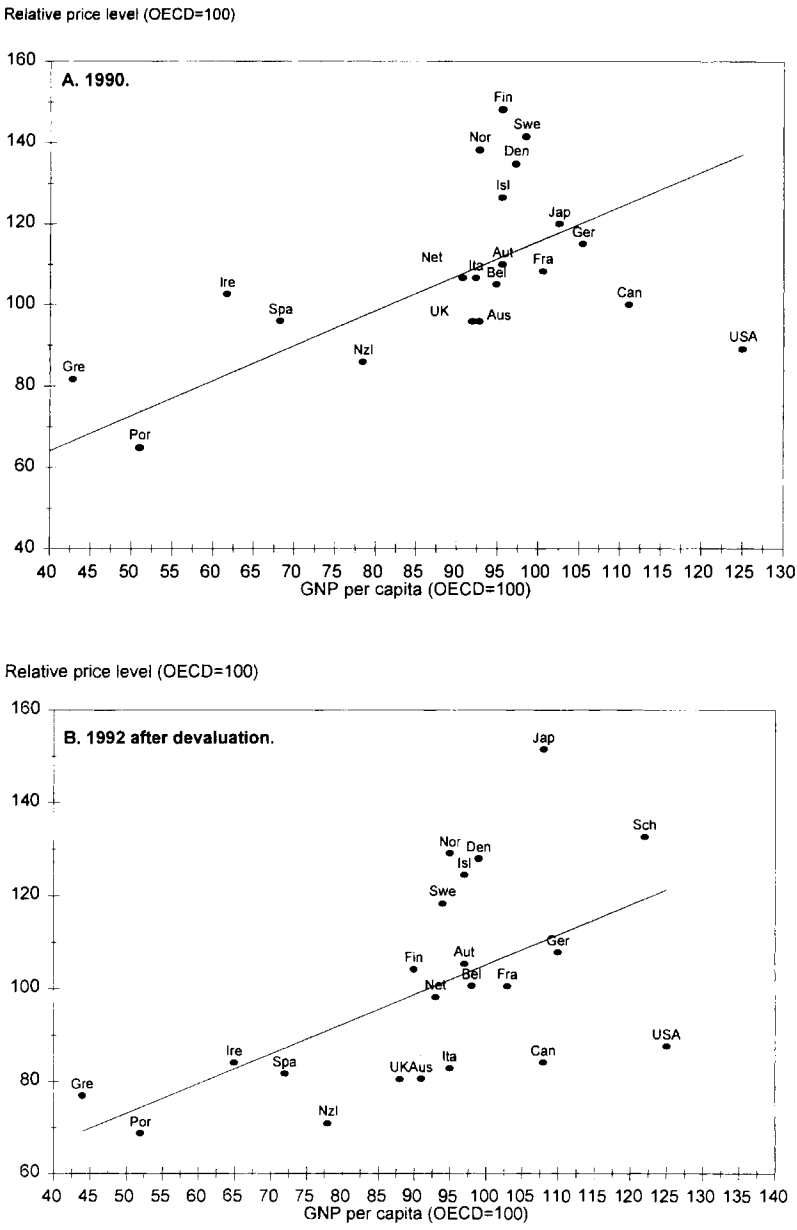

Fig. 8.1 Real incomes and relative market prices. *a*, 1990. *b*, 1992 after devaluation.

Table 8.2 **Three Measures of the Swedish Economy's Exposure to Competition**

Measure of Exposure to Competition	Share of Total (%)
Import competition:	
1. Import penetration in private production	15.1
2. Share of private production with import penetration greater than 16 percent	16
Output subsidies:	
3. Share of production affected by government subsidies:	
Private production	17
Private and public production	36
4. Share of consumption affected by restrictions on competition:	
Private consumption	62–79
Private and public consumption	75–84

Source: Measures 1 and 2 come from Flam, Horn, and Lundgren (1993). Measures 3 and 4 come from Andersson et al. (1993).

Note: Measures 1 and 2 refer to the year 1989. Measures 2 and 4 are based on import penetration per industry branch. Measures 3 and 4 refer to the year 1991.

rule. Most notably, horizontal price-fixing and market-sharing agreements are now illegal regardless of whether they can be proved to have harmful effects.[2] The only ground for exemption is increased competition. For example, an agreement between smaller firms can be accepted if it is shown to strengthen competitive pressures on larger firms. By conforming its rules to those in the EC, Sweden joins a European trend toward more reliance on the per se rules that are common in U.S. law. Prior law in the European Community as well as Sweden permitted action against restrictive practices only if they could be proved to be against the public interest.

Economists rarely get the opportunity to study the actual effects of cartels. Sweden's relaxed pre-1993 institutions, in which cartels were a matter of public record (the cartel register was abolished in the 1993 law), provide such an opportunity, and we take advantage of it. The results we obtain may, however, be of more than purely academic or historical interest. At this writing, no one can be sure how Sweden's new law will work in practice. In particular, if past formal arrangements among rivals are replaced by similar informal understandings, some of the effects we uncover may endure.

8.1.1 Government Regulation

Much concern has been expressed, most recently by the Lindbeck Commission (Lindbeck et al. 1994, chap. 3), that government regulation of markets in Sweden contributes to high prices by reducing competition. In this respect, the Lindbeck Commission reflects a growing wariness among economists about the potential anticompetitive effects of regulation that emerged from the so-

2. Fines for violation of the law have also been increased considerably (at most 10 percent of annual sales).

called economic theory of regulation.[3] More specifically, the report evinces concern that Sweden's regulatory institutions may be especially restrictive. It cites food and housing (together accounting for half of private consumption) as prime examples. In the food sector, government intervention begins with raw material prices, which are set considerably above world market prices. In this respect, Sweden does not differ from the European Community, but the implied subsidies are higher. The high input prices then engendered various tariff and regulatory barriers (e.g., product standards, minimum prices) to protect processors against import competition. Finally, entry at the retail level was subject to municipal zoning regulation, which was often used to protect the two biggest chains. It is perhaps unsurprising that this "vertically integrated" regulatory structure parallels the important participation of farmers' cooperatives at all three levels.

In housing, regulation originated with public subsidies intended to overcome shortages induced by rent control. The government specified the features of buildings that qualified for the subsidies. As with food, the housing regulation bred a web of political interests, including builders and their suppliers, that influenced the subsequent evolution of the regulation. Design standards, product registration laws, licensing requirements, etc. tended to keep foreign contractors and suppliers out and to retard domestic entry as well (OECD 1992, 82–83).

Food and housing may be extreme cases, but they exemplify a tendency toward regulatory intervention that many Swedes believe goes well beyond the ostensible public purpose (assuring the supply of food or housing) in the direction of reducing competition and raising costs. This belief, combined with Sweden's move to harmonize its regulatory system with EEC rules, has produced counterpressures. During recent years, a number of areas have been deregulated. For example, the restrictions on entry of food stores have been eased, and a large number of low-price supermarkets have opened. The European Economic Space (EES) treaty is likely to add to the pressure for less regulation. A basic principle within the EES is that any product that is legal in one member country can be freely imported into another (Cassis de Dijon principle). While exceptions to the principle may be granted for a variety of reasons,[4] the EEC court has so far granted exceptions sparingly. Accordingly, the sort of protection that has been granted to the Swedish food and building industry may be reduced.

As with Swedish competition law, it is too early to tell how the legal changes in the regulatory sphere will work out in practice. In this paper, we examine the effect of a selected and undoubtedly poorly measured set of Swedish regu-

3. The original development of the economic theory is due to Stigler (1971). A summary of subsequent work may be found in Peltzman (1989).

4. These include safety, protection of life, public order, protection of national treasures, protection of industrial or commercial ownership, effective tax control, good trading practices, public resource savings, consumer protection, protection of culture, environment, and work environment.

latory policies on prices and productivity. We find that they have, at the same time, promoted cartelization and have had more profound price and productivity effects than cartelization. Therefore, the speed with which Swedish prices will converge toward those in the European Economic Community depends in part on how quickly Swedish regulatory practice accommodates to the pressure for deregulation.

8.1.2 Industrial Concentration

The success of large multinational firms is one of the hallmarks of Swedish economic development. In areas like automobiles and trucks, telephone equipment, domestic appliances, electrical machinery, metal fabrication, and industrial machinery, Swedish firms are well-known and substantial players all over the world. Per unit of GDP, Sweden has twice as many corporations among the five hundred largest in the world as Japan and four times as many as the United States. These large Swedish multinationals convey the impression that Sweden is a land of big businesses. Because much of the production and sales of these multinationals takes place abroad, this impression is perhaps exaggerated. But it is not altogether misleading. At least in the industrial sector, the available data suggest that Swedish production is relatively concentrated. For example, in a cross-country comparison of twelve industries (Scherer et al. 1975), the average four-firm concentration ratio in Sweden (.834) was the highest among the six countries studied.[5] In only nine of the seventy-two cases studied did the concentration ratio reach 1.0, but six of these were Swedish. So Swedish industries seem characterized by unusually few firms as well as high concentration.[6]

The database used in this paper, which we describe more fully later, gives concentration data at the product level. Concentration data at this fine level of disaggregation are scant, so international comparison is impossible. However, our data leave little doubt that Swedish product markets are highly concentrated by any reasonable standard. For the eighty-three broadly representative products in our sample, the average Herfindahl index (the sum of squared shares) for annual Swedish production from 1976 through 1990 was .50. This is the equivalent of just two equal sized producers per product. The actual number of producers per product in our sample averages 2.5 and never exceeds 5.

5. Canada was second (.708). The other countries studied included the United States, the United Kingdom, France, and Germany. In part, higher concentration ratios for Sweden may of course reflect a small-country effect.

6. There is also extensive conglomeration of ownership and control. In 1985, the five biggest final owners held some 44 percent of the total voting rights in companies with more than five hundred employees, while the ten biggest had more than half (SOU 1990). In addition, these final owners tend to hold shares through intermediaries, such as investment companies, which in turn are linked through joint ownership. Fourteen such "empires" dominate the corporate sector, with three major ones alone controlling companies that account for some two-thirds of employment, sales, and total assets of the 270 largest corporations in Sweden.

High concentration tends to evoke concern about the vigor of competition. This concern is reflected in antitrust laws like those in the European Community that Sweden has adopted. Mergers, which were essentially unrestricted in Sweden before, will now come under greater legal scrutiny. However, it is far from clear on purely a priori grounds whether Sweden's high concentration has been a source of competitive strength or weakness. To some degree, achieving economies of scale requires higher concentration in smaller countries. More generally, high concentration can reflect differential efficiency, which results in lower rather than higher prices (Demsetz 1973). For example, if one or two producers discover lower marginal cost production methods, their output and market share will rise, and the extra output will tend to lower prices. A highly restrictive merger policy could end up penalizing efficiency if it slows the spread of low-cost production methods. Indeed, some of the results in this paper lend weight to this possibility.

While Swedish concentration remains high, it has been declining recently. In our sample, the average Herfindahl index declined from .563 in 1976 to .483 by 1984 and remained at this level thereafter. This decline has roughly the same effect on average concentration as would adding one average-sized firm to every third or fourth product market. In fact, however, new entry played no role in this decline of concentration. It was driven entirely by a sharp decline in the average market share of the largest firm from .64 in 1976 to .52 in 1990. As indicated above, this development does not necessarily signal an increase in competition. It could reflect waning productivity advantages of the largest firms.

Perhaps as interesting as the decline in concentration is the fact that it has been accomplished without any net new entry. Davis and Henrekson (chap. 9 in this volume) argue that Swedish tax policy has been biased in favor of large, capital intensive, widely held firms. This bias may have been motivated by the fact that income in small firms is difficult to separate from the owner's personal income. Therefore, small firms' income was taxed progressively in accordance with the welfare state's ambition to equalize incomes. Whatever the motivation, this tax bias may have discouraged new entry of small, privately held firms and thereby removed potential competitive constraints on the established firms.

8.1.3 Public Procurement

Public procurement accounts for about 20 percent of GNP. Forty percent of that is procurement by the central government, while the remainder is accounted for by municipalities and counties. In addition, many services are produced publicly that could be bought from private producers. In recent years, municipalities have begun to expose their technical and even social services to competition, and in some cases they have also turned to private producers. Table 8.3 summarizes the results of a recent study (Fölster 1993) that shows that substantial quality-adjusted cost savings were achieved in municipal and

Table 8.3 **Quality-Adjusted Cost Reductions after Privatization in Municipal Services**

	Privatized	Exposed to Competition	Decentralized	Control Group
Municipal costs	−7.9	−9.1	−4.2	−3.6
Cost effectiveness	−12.3	−9.8	−4.2	−3.6

Source: Fölster (1993).

Note: Cost effectiveness is the change in quality-adjusted municipal costs plus the entrepreneur's profit.

county services by procurement from private producers and from exposing public services to competition.

Rules concerning public procurement are sharpened considerably by a new law that will go into effect simultaneously with the EES treaty. The new law requires publication of calls for tenders in the entire EES area for large procurements. In addition, uniform rules are introduced for the conduct of procurement. A law requiring mandatory competitive tendering is being discussed but has not yet been enacted.

8.1.4 Motivation of the Study

This study tries to estimate the effect of Swedish cartels, regulation, and market structure on prices in Sweden and on costs and productivity. For reasons detailed in the next section, our estimates are biased downward. Accordingly, we view our results as indicating which of Sweden's unusual set of institutions have had important effects rather than the precise magnitude of these effects.

Since the pioneering work of Bain (1951), many cross-sectional econometric studies have focused on the relation between industry concentration, profits, and, sometimes, productivity.[7] These studies generally attempt to test the structure-conduct-performance paradigm. Concentration is considered the main dimension of structure and the main determinant of performance: attempts to exercise market power are likely to be more successful in industries that are highly concentrated. The main conclusion of this literature is that concentration has some effect on profitability, but not a substantial effect.[8]

This type of study, which was more common a decade ago, has been criticized mainly because it became increasingly clear that concentration was a poor measure of monopoly power. Also, the interpretation of results was increasingly thrown into doubt. A number of studies implied that the relation

7. Geroski (1982), e.g., estimates a simultaneous equation model with multifactor productivity and the concentration ratio as the dependent variables.

8. For a summary, see Schmalensee (1989).

between concentration and profits primarily reflected the fact that larger firms earn higher profits and that innovative, rapidly growing firms earn temporary rents to innovation. That is, high profitability could reflect either high prices or low costs.

Many recent studies of the relation between concentration and profitability have also integrated foreign trade into the analysis. Examples are Pugel (1978), Marvel (1980), and Chou (1986). A number of recent Swedish studies also follow these methods. Olsson (1991), for example, regresses dependent variables such as productivity growth and price increase at the industry level over independent variables such as concentration, export share, import share, and the occurrence of regulation. Erixon (1991) presents similar regressions both at the industry and at the company level. Stålhammar (1991) conducts a more sophisticated analysis following a method that has been applied by a number of other authors as well. Stålhammer calculates a parameter of implicit collusion for various manufacturing industries. The parameter is based on a model by Cowling and Waterson (1976) and is a function of the industry's price-cost margin and price elasticity and the firm's market share. The parameter for implicit collusion is then regressed over concentration as well as import and export shares. Stålhammar (1992) integrates both foreign trade and wage determination into the analysis.

The study reported here is based on considerably more detailed data than previous work, and it utilizes new sources of information on collusion and relative prices.

8.2 Empirical Analysis

This study uses data from a sample of Swedish manufactured products. All price data are at the wholesale level. For our purposes, this sample is a source of both strength and weakness. The data are unusually rich: we have output, price, cost, employment, etc. for every firm[9] producing a product. As far as we know, this is the first study that compares Swedish to foreign prices at the wholesale level; all the others focus on retail prices. Our data have a time-series dimension often lacking in similar studies. All these are strengths. The major weakness stems from our focus on manufacturing, where departures from competition are heavily constrained by foreign competition. The important departures from competition in Sweden probably lie elsewhere, in nontradeables like services, housing, and retailing. Accordingly, our results for manufacturing should understate the importance of restraints on competition for the whole economy. Put differently, if we do find effects of cartels, regulation, etc. in this generally competitive sector—and we do—it would suggest that similar restraints in other sectors have larger effects.

9. Except for some very small producers (fewer than ten employees) in a few cases.

8.2.1 Product Markets

Most empirical work uses the industry as the unit of observation. Many industries, however, contain a variety of distinct product markets, some of which are highly concentrated and oligopolistic, while others display intense competition. This is especially true of technology-oriented industries such as SNI 3852 (computers and office machines) or SNI 3831 (electrical industrial machinery). Some studies have already shown that using more detailed data significantly changes basic results. Kwoka and Ravenscraft (1986), for example, use "line-of-business" data and report, in contrast to previous studies, that higher concentration is correlated with lower profits.[10] Here, the level of disaggregation is even lower. A unit of observation in our study is a specified product (the seven-digit level in the United States SIC).

Product markets were selected from the list of products used to calculate the producer price index. This is in itself a representative list of products produced in Sweden or imported into Sweden. From this list, forty-eight products were selected specifically because their cartel registration status had been changed during the period 1976–90. An additional eighty-five products were randomly selected. After discarding those products that did not meet all data availability requirements, eighty-three products were left in the sample, of which thirty-four had experienced at least one change in their cartel registration status. The sample is therefore not a random sample of Swedish industry, containing as it does some bias toward product markets with cartel registration. However, the bias, if any, is slight: in 1989, 20 percent of our sample's total sales is covered by cartel agreements, as compared to SKA's estimate of 15 percent for horizontal cartels in the whole Swedish economy in that year. The sample also provides a reasonable cross section with observations from most industries. Table 8.4 shows the share of sales in each industry accounted for by our sample.

For every product in the sample, we have annual data on each Swedish producer's sales, costs, and assets, (employment, etc., for the period 1976–90). These data were provided to us by the Industrial Institute for Economic and Social Research.[11]

8.2.2 Prices

The counterfactual that we want to address is, What would Swedish prices be in the absence of various impediments to competition? The way in which we actually pursue this inquiry is to focus on the Swedish/EEC price ratio for

10. A *line of business* denotes a firm's operations in one of the industries in which it is active.

11. The data were assembled from two surveys conducted at the Industrial Institute for Economic and Social Research, the annual "Planning Survey" conducted by the Federation of Swedish Industry, as well as companies' annual reports. Some of the data (costs, assets) are at the firm or division, rather than product, level. However, product sales average around 80 percent of firm or division sales in our sample.

Table 8.4 Sample Characteristics by Industry, 1976–90

Products Group	U.S. SIC/SNI[a]	Number of Products	Average Sales per Product (million kronor)	Sample's Share of Industry's Output
1. Food	20/1, 31	10	2,011	.17
2. Apparel and leather	23, 31/32	4	416	.14
3. Wood and paper	24, 26/33, 34	8	2,415	.15
4. Packaging	30, 32, 34/35, 36, 37	3	1,563	.21
5. Industrial chemicals	28/35	7	734	.15
6. Drugs and cosmetics	28/35	3	593	.13
7. Petroleum products	29/36	4	294	.07
8. Rubber	30/36	2	519	.13
9. Stone, clay, and glass	32/36	8	324	.34
10. Fabricated metal	34/381	10	403	.07
11. Industrial machinery	35/382	7	639	.08
12. Electrical equipment and electronics	36/383	9	1,075	.12
13. Transport equipment	37/384	7	2,200	.15
14. Miscellaneous		3	878	.09
Total		85	1,314	.09

[a]Generally, two-digit level.

the same good. We ask if this ratio is higher than average when Swedish producers have cartel agreements, when Swedish regulation is unusually severe, etc. Implicitly, then, we are using the EEC prices as a "competitive" benchmark. This has considerable advantages over using accounting costs for the competitive benchmark. For example, we can avoid problems raised by the lack of correspondence between accounting and economic concepts of costs, by the aforementioned difficulty of distinguishing monopoly rents from efficiency rents, etc. In addition, the Swedish products in our sample actually do compete with EEC producers for sales to EEC customers. In this sense, there is a factual basis for treating the EEC price as a competitive benchmark. But there are also problems raised by use of this benchmark. All our measures of cartelization and regulation pertain exclusively to Sweden. Ideally, we would like similar measures for the European Economic Community. Without them, our estimates of the effects of departures from competition in Sweden are likely to be understated. For example, if a product is cartelized in both Sweden and the European Economic Community, prices in both areas could be raised without affecting the Sweden/EEC price ratio. We would then conclude erroneously that the Swedish cartel was ineffective. This sort of possibility deserves to be taken especially seriously when applied to regulation. We know that

some heavily regulated areas in Sweden (food, environmentally sensitive products) tend also be regulated in the European Economic Community. Accordingly, we will probably underestimate the effect of Swedish regulation.

Our focus on products actually exported from Sweden also imparts a downward bias to our estimates. Such a sample necessarily excludes the worst examples of inefficiency, namely, products with costs so high they cannot be competitive in export markets. Outsiders, who tend to view Sweden as a small open economy, might rule out the possibility that such great inefficiency could survive in tradable goods. However, according to Flam, Horn, and Lundgren (1993), it is not uncommon for Swedish product markets to be segmented from international competition. In such markets, the effect of reduced competition is likely to be larger than in our sample.

Our measure of Swedish producer prices relative to EEC prices for the same product uses data from both areas. The Swedish data come primarily from comparisons of export prices to prices from the home market. This information is collected by SCB (Statistics Sweden) in order to calculate changes in the producer price index.[12] A problem with these data is that the composition of countries to which Swedish firms export changes over time and differs between industries. Building material firms, for example, export much to Norway, which is an equally protected market with high prices; they export little to Central Europe, where prices generally are much lower.

To avoid this problem, a measure of export prices was calculated that corrects for the destination of exports. The basis for this correction is a producer price comparison (by Eurostat) in 1985 among European countries. Using country producer price indices backward and forward from 1985 yields a matrix of price relations among EEC countries for our sample period 1976–90. Export prices for exports from the Swedish companies to EEC countries were then related to the EEC average using the matrix described above.

More precisely, let the export price in year y be $X_{y,c,d}$ for export from country c to destination d. The home market price is $P_{y,c}$ in country c. Using the producer price comparison among EEC countries in 1985 allows calculation of the average (GDP-weighted) EEC price E_{1985}. Using national product price indices, an index (I) could then be calculated of each country's price for a product relative to the EEC average:

12. These SCB data are not available for all product groups, in part because the price information is not released in cases where individual firms can be identified. We have therefore also relied on data on domestic and export producer prices, which can also be calculated from foreign trade statistics that are divided into narrow product groups following the so-called harmonized system. For each product group, the quantity produced, the quantity exported, the quantity imported, and the sales values in nominal prices for each of these categories is published. A potential problem with this database is that, within a product group, the products that are exported may differ from those that are sold in the home market. For the product group "computer software," this is obviously an important problem. The large majority of product groups are, however, so narrowly defined that this should not be a major problem for a statistical analysis as long as the measurement error is not systematic. In some cases, we have also relied on firms' own estimates or on measurements conducted by the National Competition Board. For those product groups where we have two or three price measures, t-tests reveal no significant difference.

$$I_{y,c} = P_{y,c}/E_y \quad \text{for } y = 1976 \ldots 1990 \text{ (years of our time series)},$$
$$c = 1 \ldots 12 \text{ (EEC countries)}.$$

To illustrate, assume the following for 1985: (1) Swedish (S) widgets exported to Germany (G) sell for DM 104 ($x_{85,S,G} = 104$). (2) The closest comparable German-produced widget, which is the item used in the EEC price comparisons, sells for DM 100 ($P_{85,G} = 100$), or 4 percent less than the Swedish import. (3) The EEC price comparison shows that the German widget price is 8 percent above the EEC average price ($I_{85,G} = 1.08$). So the average EEC-produced widget would sell for DM 92.00 (DM 100/1.08).

Our procedure results in:

$$XE_{85} = X_{85,S,G}/I_{85,G} = 104/1.08 = 96.$$

This amounts to assuming that the 4 percent premium for the Swedish widgets sold in Germany is a quality premium and then adding this quality premium to the EEC average price of DM 92 to arrive at an estimate of what Swedish widgets would sell for in the European Economic Community. If we have exports to several EEC countries simultaneously, then XE is calculated as a weighted average of the separate export prices. For goods that have exports some years and no exports other years, product price indices are used to fill in the gaps.

Finally, we calculate our measure of "Swedish prices relative to EEC prices," as $P_{y,S}/XE_y$. In our example, if the Swedish widgets sold for the equivalent of DM 120 in Sweden, we would get[13]

$$P_{85,s}/XE_{85} = 120/96 = 1.25.$$

Table 8.5 shows this measure for the fourteen product groups. All prices leading to the measure shown in table 8.5 exclude VAT, so differences in relative prices cannot be explained by higher Swedish indirect taxes. There appears to be a pervasive tendency for Swedish industrial goods prices to exceed those of comparable goods in the European Economic Community. No product category, indeed, not one of the eighty-three sample products, has sold at lower average prices in Sweden than the European Economic Community over a fifteen-year sample period. However, the Swedish price premium, which averages 13.6 percent in our sample, is smaller—on the order of half—than typically found in consumer markets. This suggests that Swedish retail margins are also higher than those in the European Economic Community. In fact, there is evidence that competitive pressures in retailing are weak in Sweden.

In order to check the validity of our price comparisons, we collected two alternative price comparisons for a subsample of products. For nineteen products, firms were asked to quote prices in Sweden and the average price for the European Economic Community. For fifteen products, price comparisons were

13. Conceptually, this 25 percent Swedish premium stems from two sources: (1) the 15.4 (120/104) percent premium of the Swedish price over the German price for the same widget compounded by (2) the 8 percent premium of German widget prices over the EEC average.

Table 8.5 **Swedish Prices Relative to EEC Prices, 1976–90 (average, EEC = 100)**

Products Group	Swedish Relative Prices	Standard Deviation
1. Food	118.3	5.9
2. Apparel and leather	120.3	15.4
3. Wood and paper	119.9	19.0
4. Packaging	109.2	1.9
5. Industrial chemicals	120.5	12.3
6. Drugs and cosmetics	110.6	8.1
7. Petroleum products	113.4	5.6
8. Rubber	115.3	7.4
9. Stone, clay, and glass	107.0	3.9
10. Fabricated metal	109.2	5.5
11. Industrial machinery	110.7	3.5
12. Electrical electronics	111.8	6.3
13. Transport equipment	113.3	3.8
14. Miscellaneous	108.2	1.4
Total sample	113.6	10.1
Minimum	101.5	
Maximum	169.3	

available that had been prepared by the Swedish Competition Authority and by Eurostat. Neither of the alternative price comparisons differed significantly from our relative price measure as described above.[14]

8.2.3 Cartels and Regulation

Our data on cartels come from the Swedish cartel register. This uniquely Swedish institution, abolished in 1993, provided a public record of cartel agreements. This record is incomplete because some agreements may not have been registered. (And some agreements may have remained on the register after their substantive termination.) Nevertheless, the cartel register gives us a rare opportunity for empirical analysis of the effects of cartels across a variety of products. Moreover, although formal cartels are now illegal, cartel practices may persist. So our empirical analysis is of more than historical interest.

Our measure of the intensity of regulation is even "noisier" than our cartel data. It comes from a classification of product groups by the Swedish Competition Authority (SKA) according to the "significance" of various forms of regulation. We used the classification to assign dummies for significant regulation of (1) the *environmental* damage from manufacture of the product, (2) the *price* of the product, and (3) *technical standards* imposed on domestic sales of the product. The last category comprises goods that must meet peculiarly Swedish specifications of product or design. These could be a nontariff barrier

14. Chi squares of 1.95 (comparing firms' estimates with relative prices) and 1.57 (comparing price comparisons by independent institutions with our measure) were calculated with eighteen and fourteen degrees of freedom.

Table 8.6 **Cartel Frequency and Type**

Products Group	Product Years		% of Product Years			
	Total	With Cartel Agreement	Any Agreement (2)/(1)	Vertical Agreement Only	Horizontal Agreement Only	Both Types
1. Food	150	113	75.3	10.7	4.7	60.0
2. Apparel and leather	60	20	33.3	33.3	0	0
3. Wood and paper	120	50	41.7	15.0	10.0	16.7
4. Packaging	45	23	51.1	28.9	0	22.2
5. Industrial chemicals	105	43	41.0	21.9	0	19.0
6. Drugs and cosmetics	45	9	20.0	6.7	0	13.3
7. Petroleum products	60	6	10.0	0	10.0	0
8. Rubber products	30	0	0	0	0	0
9. Stone, clay, and glass	120	19	15.8	0	15.8	0
10. Fabricated metal	150	0	0	0	0	0
11. Industrial machinery	105	18	17.1	0	0	17.1
12. Electrical electronics	135	14	10.4	0	10.4	0
13. Transport equipment	75	15	20.0	0	20.0	0
14. Miscellaneous	45	36	80.0	0	53.3	26.7
Total	1,245	366	29.4	7.5	7.8	14.1

to imports, as when Swedish construction specifications effectively precluded some imported building materials. The standards could also restrict domestic entry if domestic firms have different compliance costs.

Tables 8.6 and 8.7 summarize the frequency of cartels and regulation across product groups in our sample. Since we have fifteen annual observations for each product, we use the "product year" to measure frequency; there are 1,245 product years (83 products × 15 years) in our sample.

Table 8.6 reveals that 366 product years, or 29.4 percent of the sample, are covered by some type of cartel agreement. The data in the cartel register allow us to distinguish horizontal (primarily price-fixing and market-sharing) from vertical (mainly exclusive-dealing) agreements. About half the agreements (14.1 percent of product years) are both vertical and horizontal, with the remainder roughly equally divided between the two types.[15] Of the horizontal agreements (detail not shown), the majority involve price fixing.[16]

15. We include "other" types under vertical, although these can have horizontal dimensions; these other agreements constitute eighteen of ninety-seven product years classified as vertical.

16. Ninety percent of the horizontal agreements have price-fixing provisions; 42 percent contain market-sharing arrangements.

Table 8.7 Frequency of Regulation

Products Group	% of Product Years			
	Any Regulation	Environmental	Price	Technical Standards
1. Food	100.0	8.7	70.0	100.0
2. Apparel and leather	0	...	...	...
3. Wood and paper	100.0	100.0	0	12.5
4. Packaging	33.3	0	0	33.3
5. Industrial chemicals	100.0	100.0	0	0
6. Drugs and cosmetics	0	...	...	...
7. Petroleum products	100.0	100.0	0	25.0
8. Rubber products	0	...	...	...
9. Stone, clay, and glass	0	...	...	...
10. Fabricated metal	0	...	...	...
11. Industrial machinery	0	...	...	...
12. Electrical electronic	0	...	...	...
13. Transport equipment	60.0	0	...	60.0
14. Miscellaneous	33.3	33.3	0	0
Total	410	25.1	8.4	19.3

A notable aspect of the table is the substantial concentration of cartels by industry. Here, the food industry deserves special mention. It accounts for slightly more than one-tenth of the sample but around one-third of all the cartel activity. This high incidence of cartelization may be rooted in the previously discussed Swedish agricultural policy, which has simultaneously pushed the prices of the industry's raw agricultural inputs above even those in the European Community and led Sweden to protect the processors against import competition. This relaxed threat of foreign entry may have encouraged domestic cartelization. Two other industry groups (wood/paper and chemicals) together account for another one-quarter of the cartel activity. In these cases, other forms of domestic regulation may be providing entry barriers conducive to cartelization.

Table 8.7 elaborates on this last point by summarizing the industrial distribution of the three types of regulation as classified by the SKA. In our sample, price regulation occurs exclusively in the food sector, and it is invariably combined with tariffs and quotas against processed food imports from the European Economic Community.[17] Thus, the price regulation category here reflects another aspect of Swedish agricultural policy. The other forms of regulation are also concentrated in a few industries: the forest products, chemical, and petroleum refining industries are subject to significant environmental regulation in Sweden, as in most developed countries. In technical standards, once more the food industry stands out; it accounts for nearly two-thirds of the sample products subject to significant technical standards.

17. This is the only product category in our sample with tariffs or quotas against EEC imports.

The tendency of cartels to form in regulated industries can be summarized by the following regressions estimated across the eighty-three sample products:

$$\text{(1)} \quad \underset{}{\text{HORIZ}} = .089 + \underset{(3.2)}{.207 \cdot \text{ENV}} + \underset{(4.5)}{.558 \cdot \text{PRICE}} + \underset{(1.7)}{.147 \cdot \text{TECH}},$$

$$\text{(2)} \quad \underset{}{\text{VERT}} = .117 + \underset{(1.4)}{.104 \cdot \text{ENV}} + \underset{(4.5)}{.644 \cdot \text{PRICE}} + \underset{(1.0)}{.111 \cdot \text{TECH}}.$$

The dependent variables are the share of a product's sample observations under the indicated type of cartel, and the right-hand side variables are dummies for the indicated type of regulation. We place *t*-ratios below coefficients, and the intercepts give the cartel frequency for products with no significant regulation. The regressions show that the presence of regulation is associated with cartel frequencies, which are, depending on the type of regulation, anywhere from two or three to around seven times the cartel frequency in unregulated markets.

Our main interest is in how this panoply of cartelization and regulation has affected Swedish economic performance. By *performance* we mean mainly prices but also the level of costs and productivity growth. Our initial exploration of these issues heeds Schmalensee's (1989, 957) advice "that the primary objective of cross-section studies (in industrial organization) must be to describe the main patterns in the data set employed as clearly and completely as possible." Thus, we begin with the main regularities in the data without claiming that they represent the reduced form of an explicit model.

8.2.4 Cartels and Regulation: Prices

Table 8.8 provides the most basic and durable such description. It shows results of regressions of Swedish relative prices (see table 8.5 above) on various cartel and regulation dummies.[18] It tells a fairly straightforward story:

1. Taken as a group, products under horizontal cartels have prices around 3 percent higher than the sample average (col. 1). This estimate does not rest heavily on conditions peculiar to the food industry (col. 2).

2. However, regulation rather than cartels seems to be the primary source of these high relative prices (col. 3). Holding constant the effect of regulation, horizontal cartels have no higher prices than the sample average.

3. The price premia associated with regulation are substantial—enough to roughly double (price regulation) or raise by half (environmental regulation) the typical Swedish price premium of 13.6 percent for affected goods.[19] These

18. The regressions also include a set of year dummies, the results of which are not reported in the table.

19. The size of the coefficients, which are estimates of these extra premia, deserves more emphasis than the *t*-ratios. The reported (OLS) *t*-ratios are exaggerated because of the persistence over time of cartels and regulation. This means that we do not really have 1,245 independent observations. Regressions that suppressed all the time variation in prices by using fifteen-year averages of the data across the eighty-three products yielded *t*-ratios around half those shown in the table.

Table 8.8 **Regression of Swedish Relative Prices on Cartel and Regulation Variables, 1976–90**

	(1)		(2)		(3)	
Independent Variables	Coef.	|t|	Coef.	|t|	Coef.	|t|
A. Cartel agreement:						
1. Vertical	−.1	.1	−.8	.8	−2.5	2.5
2. Horizontal	3.4	3.4	2.2	2.2	.1	.1
B. Food industry			4.4	3.8	−2.0	.9
C. Regulation:						
1. Environmental					7.0	9.1
2. Price					12.8	6.0
3. Technical standards					.8	.7
D. Year dummies:[a]	Yes		Yes		Yes	
$\bar{R}^2$	.09		.10		.18	
SEE	11.9		11.8		11.3	

Note: All regressions are based on 1,245 observations: 83 products × 15 years of data. Cartel/regulation variables = +1 if indicated type of cartel or regulation is in force in the year, 0 otherwise.

[a]All regressions include fourteen dummies, each = +1 for observations in years 1976 . . . 1990, coefficients not shown.

results suggest that Swedish environmental regulation is more costly than EC environmental regulation. They also reveal price regulation as the primary source of Sweden's unusually high food prices: note that food products not covered by this regulation (row B, col. 3) actually have slightly below-average price premia. However, technical standards have no marginal effects on prices in this sample.

4. Vertical restraints have theoretically ambiguous competitive effects. The frequent conjunction of vertical restrictions with horizontal cartels in our sample might arouse skepticism that vertical restrictions enhance competition in Sweden. But our results (col. 3, row A.1) are more consistent with that view than the contrary.

5. Because our measure of regulation is concentrated in a few industries, the price-increasing effects do not account for a substantial part of the overall Swedish price premium vis-à-vis the European Community. If the effect of the regulation is removed, the regression in column 3 implies that the average price premium would shrink from 13.6 to 11.3 percent. This result should be taken as a call for further work rather than as definitive estimate. If our rather crude measures of regulation can account for nearly 20 percent of the overall price premium, perhaps a more refined analysis will expand on this estimate.[20]

20. The sort of refinement permitted by our data proved unavailing. We investigated the interaction between regulation and cartels (e.g., do cartels have different effects in regulated industries than in unregulated industries?) without uncovering a consistent pattern. We also looked unsuccessfully for different effects from price-fixing and market-sharing agreements. Again, it is premature to conclude that such subtleties are absent. Rather, they may be hidden by the small number of products in our sample that fit the relevant subcategories.

Table 8.9 Market Structure, Regulation, Cartels, and Prices, 1976–90

	(1)		(2)		(3)	
Independent Variables	Coef.	|t|	Coef.	|t|	Coef.	|t|
A. Cartel agreement:						
1. Vertical	−2.3	2.3	−2.0	2.0	−2.0	2.1
2. Horizontal	0	0	−.8	.8	−.8	.8
B. Regulation:						
1. Environmental	7.1	9.3	6.8	8.9	6.6	8.7
2. Price	11.6	7.2	12.3	7.6	12.3	7.6
3. Technical standards	.2	.2	−.8	.8	−.9	.8
C. Market structure:						
1. Herfindahl index	1.19	1.4	−9.3	2.9	−9.1	2.9
2. Number of firms			−2.9	3.9	−2.8	3.9
D. Average wage (000 1990 krona)					.06	2.3
E. Year dummies:[a]	Yes		Yes		Yes	
$\bar{R}^2$	.18		.19		.19	
SEE	11.3		11.2		11.2	

Our database has enough firm-specific data to enable us to add some conventional market structure measures to the regression. Since Bain (1951), well over a hundred studies have investigated the relations between market structure measures (usually concentration) and measures of market performance (usually of profitability used as a proxy for the price marginal cost ratio). Because we have a direct measure of price performance across a variety of products, we need not rely exclusively on indirect measures like profit ratios. However, we lack EC market structure measures that should in principle be included.

The results are summarized in table 8.9. Standing alone (col. 1), concentration as measured by the Herfindahl index (the sum of the firms' squared market shares) has a weak positive effect on prices, as in most of the post-Bain literature. However, this result is decisively reversed when the number of firms is added to the regression (col. 2). The negative coefficient on concentration is consistent with the differential efficiency interpretation, whereby efficient firms raise their output (and market share) and prices decline. For example, suppose one of three initially equal size firms doubles its market share. According to column 2, row C.1, the resulting increase in the Herfindahl index $(.167)^{21}$ would be associated with a price reduction of about 1½ percent. That price reduction implies that the market share gained by the now dominant firm was accompanied by a net increase in output, which presumably results from this firm's lowered marginal costs.

At the same time, the regression suggests an important role for entry. Hold-

21. The difference between $3(1/3)^2$ and $(2/3)^2 + 2(1/6)^2$.

ing concentration constant, each additional firm is associated (col. 2, row C.2) with about 3 percent lower prices. This is a potentially significant magnitude in the Swedish context, where most goods have few producers. The regression suggests that with, say, two more producers per product roughly half the Swedish price premium could be eliminated. Entry in most of our product markets is not limited by explicit legal barriers. Therefore, actually achieving an increased number of firms would require more import competition or a change in policies that discriminate against new firms. More stringent policy on mergers could prevent decreases in the number of firms, but our results on the benefits of concentration suggest some caution. Finally, the caveat about structural interpretation of the regressions deserves special emphasis here. Causation running from lower prices, via widened markets, to more firms cannot be ruled out.

Column 3 of table 8.9 adds the industry average wage. The positive coefficient is reasonable but economically unimportant. The main reason for this is that wage differences across Swedish manufacturing industries are vanishingly small. The fifteen-year average of the real (1990 krona) wage across the eighty-three products in our sample is SKr 275,000, while the standard deviation is only SKr 5,000, or less than 2 percent of the mean. Thus, the regression implies that even a four-standard-deviation move in the average wage would not affect prices by much more than 1 percent.

All the previous results on cartels and regulation remain essentially unaltered when the market structure and wage variables are added to the regression.

8.2.5 Time-Series Analysis

By exploiting the time-series dimension of our data, we gain a check on the rather negative findings on the effects of cartels that emerged from the cross-sectional analysis. Our sample has forty changes in cartel agreements. There are about as many (twenty-one) cartel formations (new agreements, added provisions) as terminations (nineteen). The time pattern of these changes is striking. Eighteen of the formations and eleven of the terminations, or over 70 percent of all the changes, occur in 1979–83. This period saw considerable macroeconomic changes, such as an oil price "shock" and a major devaluation of the krona. Our turnover data suggest that the need for price realignments in this period stimulated new cartels but also put pressure on existing agreements.[22]

In the next set of tables, we examines price *changes* that occurred around thirty-eight of these cartel changes.[23] We also examine output changes around cartel changes. Output provides a measure of cartel effects that is, in principle,

22. A few of the terminations in 1982–83 may have been stimulated by a 1982 change in antitrust law that increased the government's power to terminate cartels proved to have harmful effects. But this law cannot have been a powerful deterrent given the high rate of cartel formation in the period.

23. Two occur in the terminal years of our sample.

Table 8.10 Price Changes and Cartel Changes

Price Variable and Interval[a]	Type of Cartel Change							
	Formation				Termination			
	Horizontal		Vertical		Horizontal		Vertical	
	% Δ	|t|	% Δ	|t|	% Δ	|t|	% Δ	|t|
A. Swedish relative price:								
1. Year of change (0)	.9	1.2	.0	.0	1.0	1.3	−3.5	3.4
2. Year after (+1)	−1.0	1.3	.9	1.3	−.6	.8	1.7	1.6
3. Year before (−1)	−1.3	1.7	.9	1.2	−.2	.2	.8	.8
4. 0 to +1	−.1	.1	1.2	1.2	.4	.3	−1.8	1.2
5. −1 to 0	−.5	1.1	.9	1.0	.9	1.1	−2.4	1.5
6. −1 to 1	−1.5	1.1	2.1	1.7	.3	.2	−.5	.3
B. Swedish domestic price:								
1. 0	.0	.0	.5	1.7	.2	.6	−.4	.9
2. +1	.2	.6	.3	1.1	.2	.7	−.2	.3
3. −1	−.4	1.2	.3	.8	.3	.9	.1	.2
4. 0, +1	.2	.4	.9	2.0	.4	.9	−.6	.9
5. −1, 0	−.4	.8	.8	1.8	.6	1.0	−.4	.5
6. −1, 1	−.2	.3	1.2	2.1	.8	1.3	−.5	.9

Note: Based on regressions with change in log of price as dependent variable. Independent variables include up to three cartel change dummies, year dummies, and, for the Swedish price change, the current and two lagged values of the changes in the log of the EEC price index for the good. Sample sizes vary from 913 to 1,162 depending on the lag structure.

[a]Each row indicates a different assumed lag structure. For example, in row 1, it is assumed that all effects occur in year of cartel change; in row 6, the effects are assumed to begin a year before and end a year after the change.

complementary to price effects (if price rises, output should decline). However, if prices are more poorly measured than output, or if product demands are sufficiently elastic, output may provide the more sensitive measure of cartel effects. Indeed, the time-series analysis supports this view. It essentially corroborates our previous negative findings on the price effects of cartels while revealing some substantial output effects.

Table 8.10 shows results for two measures of price change. They are extracted from regressions of the price change on various sets of dummies for change in cartel agreements plus controls. Because cartels can form or break up before this appears in the cartel register, we include dummies for the year preceding the change. Dummies for the year following a cartel change allow for any lagged effects of the change. Panel A shows the change in the Swedish relative (to EEC) price net of year effects. Panel B shows the change in the numerator of this price ratio—the Swedish domestic price—after controlling for current and two lagged changes in the denominator (the EEC price) and year effects. There is some evidence of price increases around formation of vertical cartels and of price decreases around their dissolution. But the over-

whelming pattern in the table is of small price changes, typically 1 percent or less and typically indistinguishable from zero. The one exception covers dissolution of vertical agreements, and here the change seems temporary and is sensitive to the way price is measured.

Table 8.11 uses nonparametric tests to hedge against the possibility that these negative results are due to a few atypical price changes or to price indexes that understate price changes. Here, we simply count signs of residuals from regressions of the price changes on controls. We want to see if positive residuals usually accompany new cartel agreements and negative residuals accompany cartel terminations. These sign counts are compared to counts in the whole sample and in a control group consisting of products in the same industry group with no change in cartel status. The results are perhaps a bit sharper than those in table 8.10 above. The main tendency is for prices to tick up when cartels are formed and down when they dissolve. But statistical significance is often lacking. The relatively small sample sizes limit the power of our tests and more refined analysis of, for example, the interaction of cartel changes with regulation.[24] Nevertheless, they add to the impression that Sweden's tolerance of cartel agreements was not a major source of its historically high prices.[25]

The evidence on output is much less equivocal: output fell substantially when cartels were formed and rose when they were dissolved. This is shown in tables 8.12 and 8.13, which are the analogs for output to tables 8.10 and 8.11 above. Table 8.12 shows that, depending on the time span and type of agreement, output fell anywhere from 6 to 13 percent when a cartel was formed and rose a comparable amount when a horizontal cartel was terminated.[26] (The apparently weaker results for vertical cartel terminations should be discounted because they are based on only one "pure" case.)[27] Table 8.13 shows that these results are not due to a few outliers. In over 90 percent of the cases, cartel formation is accompanied by abnormally low output growth and cartel termination by abnormally high growth in the year of the change. There is no similarly strong pattern for the year preceding and the year following cartel changes.

Half the cartel formations involve products subject to stringent environmen-

24. We did attempt to divide each sample into subsamples of products subject to some form of regulation and those not so subject. The consistent pattern was that prices of the regulated products rose and fell *less* frequently than other goods when cartels formed or dissolved. But this difference was insignificant.

25. The tests in tables 8.5 and 8.6 above were repeated—with essentially identical results—on (1) a sample consisting only of products that had undergone cartel switches in the period 1976–90 and (2) price change variables measured as deviations from the 1976–90 mean change for the product.

26. Essentially identical results were obtained from a sample including only those products with change in cartel status. So, e.g., for these products, output growth was 6 percent below trend in the year in which a horizontal cartel formed.

27. In eight other cases, vertical and horizontal agreements are terminated simultaneously.

Table 8.11 **Frequency of Positive Residuals for Price Changes around Cartel Changes**

Price Variable, Type of Change (number of cases)	Frequency Positive Residuals	Control Group Frequency	Difference	$\|t\|$
A. Swedish relative price:				
I. Cartel formation:				
1. Horizontal (10):				
a) Year of change	.80+	.42	.38	2.2
b) Year before	.70	.68	.02	.2
c) Year after	.40	.56	−.16	1.1
2. Vertical (13):				
a) Year of change	.62	.47	.14	.9
b) Year before	.75+	.61	.14	1.1
c) Year after	.69	.62	.07	.4
II. Cartel termination:				
1. Horizontal (17):				
a) Year of change	.41	.51	−.10	.8
b) Year before	.65	.53	.12	.8
c) Year after	.50	.59	−.09	.6
2. Vertical (9):				
a) Year of change	.00−	.53	−.53	5.2
b) Year before	.78	.54	.24	1.3
c) Year after	.75	.59	.16	1.0
B. Swedish price:				
I. Cartel formation:				
1. Horizontal (10):				
a) Year of change	.80	.51	.29	1.60
b) Year before	.56	.75	−.19	1.12
c) Year after	.70	.68	+.02	.11
2. Vertical (12):				
a) Year of change	.83+	.56	.27	2.19
b) Year before	.64	.61	.03	.16
c) Year after	.75	.68	.07	.46
II. Cartel termination:				
1. Horizontal (16):				
a) Year of change	.44	.73	−.29	2.39
b) Year before	.86+	.77	.08	1.04
c) Year after	.60	.69	−.09	.66
2. Vertical (9):				
a) Year of change	.22−	.73	−.51	3.40
b) Year before	.89+	.76	.13	1.20
c) Year after	.63	.57	.06	.43

Note: Numbers in parentheses are number of cases. Cartel with both horizontal and vertical provisions (three formations, eight terminations) is counted twice. Cases used in computations vary because of different underlying lag structures of the two regressions used to generate residuals and because 1975 and 1991 data are unavailable. + (−) = significantly (5 percent) greater (smaller) than overall sample frequency. Control group is products in same industry group with no change in cartel status in the relevant period.

Table 8.12 **Output Changes and Cartel Changes**

	Type of Cartel Change							
	Formation				Termination			
	Horizontal		Vertical		Horizontal		Vertical	
Interval	% Δ	|t|	% Δ	|t|	% Δ	|t|	% Δ	|t|
1. Year of change (0)	−5.8	2.7	−10.5	5.7	+6.7	3.3	+2.5	.9
2. Year after (+1)	−3.0	1.4	+3.8	2.0	−.4	.2	−.4	.1
3. Year before (−1)	−4.1	1.9	1.0	.5	−.2	.1	−1.3	.4
4. 0 to +1	−8.8	2.9	−7.1	2.7	+6.2	2.1	+1.9	.5
5. −1 to 0	−10.0	3.3	−9.7	3.6	+6.5	2.2	+1.4	.3
6. −1 to 1	−13.3	3.5	−6.4	1.9	+6.2	1.7	+1.3	.3

Note: See the note to table 8.10 above. This table is based on regressions with the change in log of output, year t minus the average annual change, 1976–90 as the dependent variable, and year dummies as independent variables. Sample size varies from 996 to 1,162 depending on the log structure.

tal regulation. In the year of a cartel formation, output of these goods fell much more (17 percent for horizontal and 20 percent for vertical cartel formations) than for other goods. These differences, which are statistically significant, may imply that the usual threat to cartel stability from potential output expansion is weakened by environmental restrictions. Actual output expansion when cartels terminated proved to be no different for goods subject to environmental regulation (one-third of terminations) than for others.

There is an obvious tension between the results on price changes and those on output changes that we cannot resolve here. Taken literally, the results seem inconsistent with rational cartel behavior, which employs output restriction only if this raises prices. Alternatively, our results might suggest that our price measure is not accurately reflecting transaction prices or nonprice attributes (quality, delivery time, etc.) of products. However, tests for changes in two measures of profit margin around cartel changes yielded the same negative results as for prices.[28] This lack of response of profit margins to cartel changes implies that measurement problems alone do not account for our odd results on prices.

8.2.6 Cartels Regulation and the Efficiency of Production

Standard theory does not have much to say about the effect of cartelization or regulation on the efficiency of production. Nevertheless, at least since Adam Smith contended that "monopoly . . . is a great enemy to good management," economists have suspected a connection between competition and production

28. The two measures, described more fully in the next section, are profits before capital costs/sales and value added per employee. All else the same, these would increase if prices rose or lower-quality goods were sold at unchanged prices.

Table 8.13 **Frequency of Positive Residuals, Output Changes around Cartel Changes**

Type of Change (number of cases)	Frequency Positive Residuals	Control Group Frequency	Difference	$\|t\|$
I. Cartel formation:				
1. Horizontal (10):				
a) Year of change	.20−	.62	−.42	2.2
b) Year before	.20−	.45	−.25	1.9
c) Year after	.70	.38	.32	1.5
2. Vertical (13):				
a) Year of change	.00−	.65	−.65	13.5
b) Year before	.31	.48	−.18	1.2
c) Year after	.69	.49	.21	1.5
II. Cartel termination:				
1. Horizontal (17):				
a) Year of change	.94+	.46	+.48	4.4
b) Year before	.41	.52	−.11	.8
c) Year after	.63	.57	+.05	.4
2. Vertical (9):				
a) Year of change	1.00+	.38	+.62	9.2
b) Year before	.44	.48	−.04	.2
c) Year after	.50	.67	−.17	1.0

Note: See the notes to tables 8.11 and 8.12 above.

efficiency. Our data allow us to investigate this connection for Sweden and thereby to shed light on the question of whether lack of competition in Sweden has contributed to the perceived high-cost structure of its manufacturing sector. We begin with regressions describing the connection between measures of static efficiency and productivity growth, on the one hand, and cartelization and regulation, on the other.

8.2.7 Static Efficiency

We use two measures related to static efficiency: gross profits as a percentage of sales (the "price-cost margin") and value added per worker.[29] All else the same (including prices), more efficient use of resources would raise both measures. The two measures differ in their treatment of labor rents. These reduce profitability but not value added.[30] So labor rents show up as an inefficiency in the profit-based measure but not in value added per worker. Our choice of measures is dictated in part by lack of data on raw material prices. This precludes investigation of efficiency in the use of raw materials. Finally, our efficiency measures are for the aggregate of the firms or divisions producing a product, while the competition measures are product specific. Recall,

29. Gross profits are before depreciation and capital costs, and value added is just gross profits plus employment costs.

30. Any rents to outside suppliers would reduce both profits and value added.

Table 8.14 **Profits/Sales, Value Added per Worker, Competition and Regulation**

	Profits/Sales × 10^2				Value Added/Worker (SKr 000)			
	(1)		(2)		(3)		(4)	
Independent Variables	Coef.	|t|	Coef.	|t|	Coef.	|t|	Coef.	|t|
A. Cartels:								
1. Vertical	−.2	.3	−.0	.0	−21	1.5	−15	1.1
2. Horizontal	1.3	1.3	1.7	1.7	29	2.1	30	2.1
B. Regulation:								
1. Environmental	3.8	5.2	3.8	5.3	46	4.3	44	4.1
2. Price	7.5	4.9	7.4	4.8	77	3.4	81	3.6
3. Technical standards	.4	.4	.7	.7	22	1.5	19	1.3
C. Capital intensity:								
1. Capital/sales	7.3	3.5	7.4	3.5				
2. Capital/worker (SKr 000)					.22	19.4	.22	19.3
D. Market structure:								
1. Herfindahl index			9.0	2.9			68	1.5
2. Number of firms			1.1	1.5			−4	0.4
E. Year dummies:	Yes		Yes		Yes		Yes	
$\bar{R}^2$	.20		.21		.39		.40	
SEE	10.8		10.8		158.0		156.9	

however, that these products account for around 80 percent of firm or division sales in our sample.

Table 8.14 summarizes the relation between both measures and competition/regulation. (The regressions include capital intensity variables as controls.) The results here need to be interpreted in the light of the previously discussed price effects summarized in tables 8.8 and 8.9 above because either higher prices or greater efficiency can raise profits or value added. Specifically, if b_{π_i} or b_{v_i} denotes a coefficient of interest in the profit or value added regression, respectively, of table 8.14, and if b_{p_i} is the coefficient of the same variable in the earlier price regression, the following approximations[31] obtain:

$$(3) \qquad \frac{\%\ \Delta\ \text{cost/unit}}{\Delta i} = \frac{b_{p_i}}{\text{price}} - b_{\pi_i}\left(\frac{\text{sales}}{\text{costs}}\right),$$

31. These follow from the relations

$$\frac{\text{profits}}{\text{sales}} = \frac{\text{price} - \text{unit cost}}{\text{price}},$$

$$\frac{\text{value added}}{\text{worker}} = (\text{price} - \text{purchases per unit})\left(\frac{\text{output}}{\text{worker}}\right).$$

We assume that "purchases per unit" is a parameter.

Table 8.15 **Estimated Effect of Competition and Regulation on Unit Costs and Output per Worker**

Variables	Effect of Unit Change on: Cost/Output (%)	|t|	Effect of Unit Change on: Output/Worker (%)	|t|
A. Cartels:				
1. Vertical	−1.8	1.5	+1.6	.5
2. Horizontal	−2.8	1.9	+4.0	1.1
B. Regulation:				
1. Environmental	+1.3	1.2	−6.8	2.5
2. Price	1.8	.8	−12.1	2.1
3. Technical standards	−1.9	1.3	5.5	1.5
C. Market structure:				
1. Herfindahl index	−19.2	4.0	34.3	3.0
2. Number of firms	−3.9	3.5	5.8	2.3

Note: Based on coefficients from col. 2 of table 8.9 and cols. 2 and 4 of table 8.14. For formula combining these coefficients, see the text. Estimates are taken at sample means of all relevant variables.

$$(4) \qquad \frac{\%\ \Delta \text{ output per worker}}{\Delta i} = \frac{b_{v_i}}{\text{value added/worker}} - \frac{b_{p_i}}{(\text{price})\ (\text{value added/sales})}.$$

We can then estimate the effect of a change in competition or regulation (Δi) on efficiency by appropriately combining the two coefficients. The results of this exercise are shown in table 8.15, which uses the price regression in column 2 of table 8.9 above and the regressions in columns 3 and 4 of table 8.14 above to generate estimates of the effect of competition and regulation on static efficiency at the sample means of the relevant variables. To illustrate how these estimates were arrived at, we can work through a specific case. Table 8.15 says that Swedish environmental regulation has reduced output per worker by 6.8 percent.[32] This is the net result of effects on price (table 8.9) and on value added (table 8.14). It is computed as follows. According to column 2 of table 8.9, environmental regulation raises Swedish relative prices by 6.8 points, or 6 percent of the mean value (113.6) of the Swedish relative price index. By itself, a 6 percent price increase would raise sales by 6 percent. Because value added is only about 40 percent of sales, a 6 percent sales increase would be amplified

32. The associated |t| of 2.5 (and all other *t*-ratios in the table) is subject to two offsetting biases: (1) the aforementioned (n. 18) upward bias stemming from overstatement of the true degrees of freedom and (2) a downward bias resulting from the assumed independence of the coefficients b_{p_i} and b_{v_i} or b_{π_i} when they are likely to be positively correlated.

into a 15 percent (6/.4) rise of value added, which would translate into an extra SKr 78,000 per worker (in 1990 prices, given a mean value added per worker of around SKr 520,000). However, column 4, row B.1 of table 8.14 tells us that only SKr 44,000, or 56 percent of the potential increase in value added, is attained. Table 8.15 attributes this shortfall of SKr 34,000 to a decline in output per worker. In short, the actual increase in value added (about 8 percent) is the result of the 15 percent potential increase from higher prices and the partly offsetting roughly 7 percent reduction in output per worker.

The results in table 8.15 suggest that cartels are not associated with a loss of production efficiency. In fact, if anything, cartelized industries were more efficient. Environmental regulation and price regulation, however, do seem to be associated with nontrivial productivity losses. The former is expected because expenses for environmental protection do not produce measurable output. The large (12.1 percent) productivity loss for price-regulated goods implies that the minimum prices shelter considerably inefficiency. And the correspondingly modest unit cost effect (1.8 percent) suggests that suppliers and workers are sharing the costs of this inefficiency with firms and consumers.

The results for the market structure measures imply an important connection between competition and efficiency, but one that needs to be interpreted carefully. At the margin, an extra firm is associated with 6 percent increased output per worker. But the results for the Herfindahl measure of concentration imply that attempts to maintain the number of firms by a vigorous anticoncentration policy would be mistaken. Consistent with the previously articulated differential efficiency story, the more concentrated industries tend to be the more efficient. The large numbers in row C.1 of table 8.15 need to be discounted because they refer to an unrealistic shift from atomistic competition to monopoly. A more realistically modest change in the Herfindahl index, say .2,[33] would still suggest a considerable productivity gain (around 7 percent higher output per worker) from expansion of efficient leading firms. Similarly, the results imply that the decline in Swedish concentration over the sample period is associated with reduced output per worker and higher unit costs. The average decline in the Herfindahl index has been .08. The results in table 8.15 translate this into a 1½ percent reduction of output per worker. Recall that all the reduced average concentration has come from the largest firm's loss of market share. So the differential efficiency story would link the reduced efficiency to a steady weakening of the largest firms' productivity advantages. If there is a policy implication in these results, it would be to eliminate any barriers to new entrants while allowing market forces to determine how concentrated markets become.

33. Approximately the result when one of three previously equal sized firms doubles its market share.

8.2.8 Productivity Growth

For each product in our sample, we estimated the average annual growth in productivity for 1976–90 under two measures: a "Solow residual" estimate of total factor productivity (TFP) growth and the more traditional growth of output per worker. The TFP growth estimate is

$$\text{output growth} - \alpha(\text{labor input growth}) - (1 - \alpha)(\text{capital input growth}),$$

where α is labor's share of output. This is an estimate of the growth of output per unit of input.[34] We are limited to a two-input production function by the aforementioned lack of data on material inputs, and we also recall that our output measure is at the firm rather than the product level. We estimated α as (wage costs/value added) over the fifteen-year period for each product.[35] It is of particular importance to note that our output series is obtained by deflating sales by a product price index. Total employment and an estimate of the real value of fixed assets constitute our input measures. For our sample, TFP growth averages 1.62 percent per year, while labor productivity grows at 2.46 percent per year. These are broadly typical of manufacturing in Europe and North America over the period 1976–90.

The relation between TFP growth and competition and regulation is spelled out in table 8.16. The first two regressions show that cartelized and regulated industries have experienced generally subpar productivity growth. These negative effects are not always precisely estimated, but they tend to be numerically large. For example, regression (2) implies essentially zero TFP growth for products subject to horizontal cartels. This regression also implies, somewhat in contrast to the results for the level of productivity, that higher concentration and more firms are associated with lower TFP growth. This is similar to Salinger's (1990) finding that concentrated industries in the United States experienced a reversal of previously favorable cost trends in roughly the same period.

The third regression in table 8.16 adds an industry-group EEC price trend variable. This is meant as a control for industry-specific factors, hopefully unrelated to Swedish competitive and regulatory conditions, which affect productivity in all countries. For example, productivity in electronics has generally been well above average, and this is reflected in generally declining relative prices for electronics products both in Sweden and the European Economic Community. Since we lack direct estimates of industry sector TFP growth outside Sweden, we use the EEC price trend as a proxy. The addition of this variable essentially wipes out every previous result and dramatically boosts the

34. It is based on the assumption of factor neutral technical progress and Cobb-Douglas technology.

35. An alternative in which the share of capital was obtained by multiplying the samplewide fifteen-year rate of return by the capital stock yielded essentially identical conclusions.

Table 8.16 Total Factor Productivity Growth, 1976–90

	(1)		(2)		(3)	
Independent Variables	Coef.	|t|	Coef.	|t|	Coef.	|t|
A. Cartels:						
1. Horizontal	−1.22	1.7	−1.56	2.1	−.04	.2
2. Vertical	+.46	.7	.47	.7	.11	.6
B. Regulation:						
1. Environmental	−.47	1.1	−.53	1.3	+.19	1.6
2. Price	−.41	.5	−.15	.2	−.20	.8
3. Technical standards	−.74	1.3	−.96	1.7	+.01	.4
C. Market structure:						
1. Herfindahl index			−3.30	1.7	−.25	.4
2. Number of firms			−.77	1.7	−.10	.8
D. Median industry price change in EEC, 1976–90					−.98	30.4
$\bar{R}^2$	.10		.11		.93	
SEE	1.54		1.53		.42	

Note: Sample = 83 products. Dependent variable is annual percentage growth of total factor productivity between 1976–77 and 1989–90. For definition of total factor productivity, see the text. Cartel, regulation, and market structure measures are 1976–90 averages of annual values. EEC industry price change is the median value for the industry group of the annual rate of change of EEC product price indexes for 1976–77 to 1989–90.

regression's fit. The coefficient of this variable is around –1, which might suggest that it is a perfect proxy for industrywide TFP trends.[36]

There is, however, need for caution in taking this result at face value. Recall that output growth is estimated as the difference between the growth of sales and of product prices. Any measurement error in industry price trends common to Sweden and the European Economic Community will be translated into an opposite-signed error in estimated TFP growth. For example, if electronics price indexes generally understate quality improvement, TFP growth in electronics will be correspondingly understated. The coefficient of –1 on the EEC price variable would also be consistent with the (probably unrealistic) extreme case in which the common measurement error accounted for all the variance in price trends across products. Correlation of this error with the cartel and regulatory variables could then bias their coefficients in the third regression.[37]

Table 8.17 repeats the exercise in table 8.16 using a labor productivity measure. Growth of capital per worker is added as a control. The results of interest are nearly identical. So any conclusions seem insensitive to the way productivity growth is measured.

36. If TFP growth is translated point for point into lower price growth.

37. Electronics and fabricated metals have the best measured price performance in both the European Economic Community and Sweden, and they show relatively little cartel and regulatory activity.

Table 8.17 Growth Rate of Output per Worker, 1976–90

	(1)		(2)		(3)	
Independent Variables	Coef.	|t|	Coef.	|t|	Coef.	|t|
A. Cartels:						
1. Horizontal	−1.17	1.6	−1.48	2.0	−.02	.1
2. Vertical	+.39	.6	.41	.6	.05	.5
B. Regulation:						
1. Environmental	−.51	1.2	−.56	1.4	.15	1.9
2. Price	−.25	.3	−.01	.0	−.05	.3
3. Technical standards	−.78	1.4	−.98	1.8	+.02	.2
C. Market structure:						
1. Herfindahl index			−2.99	1.5	−.05	.1
2. Number of firms			−.72	1.6	−.90	.05
D. Growth rate of capital per worker	.91	3.8	.86	3.6	.90	20.2
E. Median industry price change, EEC					−.97	45.8
$\bar{R}^2$	.18		.19		.97	
SEE	1.49		1.48		.27	

Our conclusions about dynamic efficiency have to be tentative. What is clear is that the cartelized and regulated sectors in Sweden generally have been substantial laggards in TFP growth. This tendency is especially pronounced for horizontal cartels and for environmental and technical standards regulation. What remains unclear is the precise role of Swedish cartels and Swedish regulation in bringing this result about. Among the possibilities that we must acknowledge are that (1) the pressure to cartelize an industry and provide regulatory barriers to entry is greater where productivity growth is low and (2) barriers to competition similar to those in Sweden operate in the European Economic Community for similar products and hinder productivity growth there to roughly the same extent as in Sweden. The one reasonably clear conclusion from our data is that cartelization and regulation have not enhanced productivity growth in Swedish manufacturing.[38]

8.2.9 Simultaneous Equations

In the previous analysis, determination of firms' productivity growth and market prices were analyzed separately. For several reasons, there may be important linkages between the two. A productivity increase tends to lower the

38. We can also say that any effects of cartelization take some time to show up. For the sample of products with changes in cartel status, we regressed the difference between annual and long-run TFP growth on cartel and year dummies. A similar regression was estimated for labor productivity growth. The coefficients of the cartel dummies were small and insignificant in both regressions. This means that productivity growth for the same product does not noticeably lag behind its long-run trend in the years just following a cartel agreement.

Table 8.18 **Simultaneous Estimation of Relative Prices and TFP Growth**

	Relative Price		TFP Growth	
Independent Variables	Coef.	*t*	Coef.	*t*
A. Cartels:				
1. Vertical	−.046	1.2	−.0001	0
2. Horizontal	.015	.3	.0001	0
B. Regulation:				
1. Environmental	.06	2.5	.04	2.0
2. Price	.12	2.2		
3. Technical standards	−.001	0	.004	.2
C. Median industry price change in EEC, 1976–90			−.98	28.1
D. Dependent variables:				
1. Relative price	−.03	.6	−.21	.8
2. TFP growth				
$\bar{R}^2$	.11		.93	
SEE	.09		.057	

profit-maximizing price, even for a firm with monopoly power. Holding constant the level of cartelization and regulation, one would therefore expect firms with faster productivity growth to charge lower prices.

The price that a firm charges may in turn affect productivity growth. Monopoly power should be reflected in the price levels, even after controlling for our measures of cartelization and regulation, since these probably contain a considerable measurement error. To the extent that monopoly power affects productivity growth, one would therefore expect a relation between the price level and productivity growth.

In order to test these linkages, the simplest approach is to estimate a simultaneous equation model following the structure of the productivity growth equations reported in the previous section. In the first system in table 8.18, TFP growth and relative (to EEC) prices are the dependent variables in a cross-sectional estimation over the eighty-three product markets. Relative prices and "level" variables are averages over the period 1976–90.

As in any simultaneous system, a key question is how well the equations are identified. In this estimation, the EEC price trend variable is a natural choice as a variable to identify the productivity growth equation. For the relative price equation, we use the price regulation dummy as an identifying variable. This assumes that price and quantity regulation affect productivity growth via price changes.

The results in table 8.18 broadly confirm the single-equation results reported above. Environmental regulation affects both productivity and prices. The independent linkage between relative prices and TFP growth appears small. One could argue that productivity growth should affect the relative price change

rather than the relative price level. Substituting relative price change for relative price levels yields similar conclusions, however, and is therefore not reported here.

Instead, a more careful modeling of how prices affect productivity seems to bear fruit. The most frequently stated argument is that high prices may imply high profits. High profits in turn reduce employees' efforts and therefore depress productivity growth. The link between prices and profits, however, may be quite weak. Therefore, one may get stronger results by explicitly modeling the effects of prices on the profit rate and the effects of the profit rate on productivity growth.

We replace the simple productivity growth variable with a new variable, "relative productivity growth," which shows productivity growth relative to that in EEC countries. This is calculated as

$$\text{relative productivity growth} = (1 + \text{TFP growth})/(1 - \text{median industry price change in EEC}).$$

This achieves essentially the same as was done in previous regressions by introducing EEC price change as an independent variable. However, it ensures that productivity growth is also corrected by EEC price change in the profit equation.

Since productivity growth also affects profits, we model this as a system with three simultaneous equations with the dependent variables being the profit rate, relative productivity growth, and relative prices. The profit equation contains relative productivity and relative prices as explanatory variables, and the wage rate is used to identify the equation. The relative productivity equation contains profits and the cartel and regulatory variables. It is identified by the cartel and regulatory variables since we let the relative price enter recursively only into the profits equation. Thus, the relative price is a function only of the cartel and regulatory variables. This is motivated because theoretically relative prices should affect relative productivity only through profits, not directly.

The results are shown in table 8.19. They indicate that relative productivity growth has a significantly positive effect on the profit rate. The profit rate, on the other hand, has a significantly negative effect on productivity growth. Environmental regulation and price and quantity regulation raise relative prices and thus feed through to the profit rate and relative productivity growth.

These results indicate that monopoly power may indeed have a significantly negative effect on productivity growth via the profit rate. However, our measures of monopoly power in the form of the cartelization variables may contain too much measurement error to pick up much of a direct link from cartelization to productivity growth.

Finally, a common argument is that high profits lead to high wage demands. Therefore, wages should be treated as an endogenous variable. We have estimated such models also, but the results remain broadly the same. This is not

Table 8.19 **Simultaneous Estimation of the Profit Rate, Relative TFP Growth, and Relative Prices**

	Profit Rate		Relative TFP Growth		Relative Prices	
Independent Variables	Coef.	*t*	Coef.	*t*	Coef.	*t*
A. Cartels:						
1. Vertical			−.012	.6	−.04	1.1
2. Horizontal			.006	.23	.03	.7
B. Regulation:						
1. Environmental			.009	.6	.07	2.2
2. Price			−.032	.99	.115	2.1
3. Technical standards			.008	.5	−.0005	.01
C. Wage level	−.004	.2				
D. Dependent variables:						
1. Profit rate			.39	2.5		
2. Relative TFP growth	1.85	3.3			−.13	.3
3. Relative price	.34	1.75				
$\bar{R}^2$	.13		.15		.11	
SEE	.2		.09		.09	

surprising since wage levels in Sweden have primarily been determined at more central levels than the firm. For that reason, they do not differ much between firms.

8.3 Summary and Conclusions

The broad conclusion to which our results point is that Sweden's tolerance of cartels and its regulatory policy have negatively affected the performance of Swedish manufacturing. We have found evidence of such negative effects on prices, output, productivity, and productivity growth. These effects are summarized in table 8.20. It can be seen at a glance that virtually all the effects that we have been able to detect are negative and that they are often substantial. As between the effects of cartels and regulation, the latter are the more substantial.

The effects that we have been able to measure are probably understated. In essence, we have measured these effects as differences between a "treatment" group and a "control" group of products. To estimate the effects of the treatment (cartels, regulation) properly, we would need a control group entirely free of treatment effects. However, this is not what we have. The control group includes products with no *publicly registered* cartel agreements. But it includes products with undisclosed cartels. The control group include products without unusually severe regulation of three *specific* types. But it includes products subject, in varying degrees, to some of these and to other kinds of regulation that may have effects on competition. Accordingly, we are able to estimate only

Table 8.20 Summary of Effects of Cartels and Regulation

Institution (main affected sectors)	Prices	Output	Productivity Output/Worker	TFP Growth (per year)
Cartels (food, wood/paper, packaging, chemicals)	−2% in vertical agreements	−6% to −13% after agreement, +6% after agreement is terminated	No	−1.6% for horizontal agreements
Regulation:				
1. Environmental (wood/paper, chemicals, petroleum)	+6%	. . .	−7%	−.5%
2. Price (food)	+11%	. . .	−12%	No
3. Technical standards (food, packaging, transport equipment)	No	. . .	No	−1%
Relevant averages from sample	+13.6% Sweden v. EEC	5.6% standard deviation of yearly output change	SKr 520,000 value added per worker	+1.6%/ year TFP growth

Note: "No" = no effect found. . . . = data unavailable.

differences between more and less cartelization and regulation rather than the full effects of these treatments. Also, recall that there is a further downward bias in our estimates of price effects stemming from our inability to control for effects of policies within the European Economic Community that are similar to those in Sweden. Specifically, the estimated price effects of environmental and price regulation (+6 percent) and +11 percent) are the (extra) premiums over similar products sold in EEC markets. But those products (e.g., chemicals and food) are also heavily regulated in the European Economic Community. So our estimates imply that Swedish regulations has historically been more stringent than EEC regulation. They do not, however, reveal the full price effects of the regulation.

Finally, recall that we analyzed prices of tradables that Sweden exports. Thus, the Swedish producers in our sample have survived the rigors of international competition. By focusing on this relatively efficient and competitive sector, we have missed the worst examples of inefficiency and high prices induced by regulation or lack of competition in Sweden. The fact that we found any significant price and efficiency effects in this sample suggests larger, more widespread effects in the more sheltered areas of the economy.

Because of the preceding caveats, our results should be regarded as suggestive rather than as precise estimates of the negative effects of cartelization and regulation. It seems safe to conclude that these effects are hardly trivial. They have, if anything, grown worse over time given the reduced productivity

growth that we have found in the regulated and cartelized sectors of Swedish manufacturing.

Sweden's prospective entry into the European Community has begun to force changes in the institutions that governed the period we have studied. Because of this, our results give grounds for optimism about the likely evolution of Swedish manufacturing. The adoption of EC antitrust standards will presumably narrow the scope for cartels in Sweden. Our results imply that a less heavily cartelized Swedish manufacturing sector will be more efficient, both statically and dynamically. Inevitably, integration into the European Community will bring pressure for a convergence of regulatory institutions. This will lead to a corresponding convergence of costs, which, our results imply, will improve Sweden's relative position. Indeed, there is evidence that some of this has already occurred. We broke the period 1976–90 into halves and estimated separate price effects of regulation in each half. For both price and environmental regulation, the effect on Swedish prices was greater in the first half (1976–82) of this period than in the second. In the case of environmental regulation, the extra Swedish price premium narrows significantly from 10 percent in 1976–82 to around 3 percent subsequently. A smaller and less statistically reliable[39] narrowing occurred for goods subject to price regulation, from a 15 percent to a 10 percent extra price premium. Pressures for further narrowing of these Swedish price premiums can only grow as Sweden integrates into the European Community. These pressures will be uneven because the degree of regulation and cartelization has varied across Swedish industries. The food sector, in particular, stands out among those Swedish industries that will be most substantially affected by the convergence of Swedish and EC policies. Much of this industry has been cartelized, subjected to minimum price regulation, and protected from entry by products not meeting Swedish technical standards. If these practices are eliminated, our data suggest that Swedish food prices will decline by around 10 percent in real terms at the wholesale level and that output per worker will grow a like amount. At the same time, the industry is likely to reverse its distinctly subpar record of productivity growth.

Swedish manufacturing is highly concentrated, and this can raise concerns about the vigor of competition. Our results, however, suggest that such concerns are overstated. Indeed, we find that the most concentrated Swedish industries tend to have significantly lower domestic prices and a substantial, although narrowing, advantage in output per worker over less concentrated industries. We interpret this to mean that, where regulatory barriers to entry are absent, high concentration in Sweden reflects cost advantages of large firms. The proviso here is potentially important because we find lower prices and higher productivity where there are more firms. These twin results suggest the need for distinguishing between concentration and the number of firms in evaluating Swedish market structure. In particular, it would not be surprising

39. The relevant t-ratio is 1.9 vs. 5.1 for the environmental case.

if Swedish production becomes more concentrated as its markets become more accessible to EEC producers. This would occur if less-efficient domestic production is replaced by imports. In this case, as long as the number of sellers is not reduced, our results imply favorable price and productivity effects flowing from the increased concentration. The implications for competition policy seem fairly straightforward. It is our layman's impression that EEC policy toward mergers is generally less restrictive than that of the United States. Were it otherwise, Sweden might be ill served by legal restraints on the mergers and exits that will accompany the realignment of its manufacturing capacity when it joins the European Economic Community. Removal of institutional obstacles to entry and regulatory restraints on competition would appear to merit more attention than restraints on concentration.

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