Industry Rivalry and Strategy in the Regulatory Process

Sharon Oster
Yale University

Conducted under SBA contract/grant. Statements and conclusions herein are the contractors' and grantee's and not views of the U.S. Government or the Small Business Administration.
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Sharon Oster
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September 1980

*The research on which this work was based was funded by the Federal Trade Commission and the Small Business Administration; however, the ideas expressed herein are the author's and in no way are intended to express the views of either agency. I would like to thank Richard Nelson, Richard Levin, and Al Klevorick for helpful comments.*
The standard literature on regulation generally assumes that firms within an industry act cooperatively in pressuring government for or against particular regulations. Yet in many cases new regulations impose very different benefits and costs on sub-groups within an industry. In this paper, I discuss a model in which rivalrous sub-groups of firms within an industry, recognizing the effect of regulations both on themselves and on their rivals, try to use the regulatory apparatus as a strategic weapon in the battle for market shares (Oster, 1979). The critical characteristic of this case is that the sub-groups produce different mixes of substitute products, and there are some barriers to mobility within the industry. Questions posed in this paper include: When should we expect firms to cooperate in preventing or inducing new regulations, and when should we expect firms to use regulation against one another? In Section 2 of this paper, I review several recent trade rules promulgated by the Federal Trade Commission and consider in each case whether firms behave cooperatively or rivalrously in response to these rules.
I. **Conditions for the development of strategic sub-groups in the regulatory process**

Stigler (1971), and later Peltzman (1976) discussed conditions under which an industry might be expected to intervene in the regulatory process. In general, industry action will be expected whenever the expected benefits to the industry of this action exceed its costs; benefits and costs will in turn depend on the structure of the industry. In this literature, the industry uses regulation as a barrier to entry against possible new competitors, and as a way to exploit as fully as possible the existing market power of the industry.

In fact, many industries are not homogeneous. The interest of any one firm in the regulation may differ from the interest of the industry in general; indeed it may even be difficult to define precisely what we mean by the industry's interest. In this case, the central question becomes not what is the industry's interest in a particular regulatory change, but rather what does the regulation do to the positions of the various different firms within the industry. In a simple case, for example, one might imagine a regulation which reduces the total industry market while simultaneously rearranging market shares among firms; if the rearrangement is large, one might find some firms supporting the regulation while others oppose it. I want to argue that a firm may at times support a regulation which in the short term adversely affects that firm, because the firm knows its rival will be hit even harder by the regulation. In this case the firm may improve its within industry position sufficiently to offset the loss imposed on the industry in general. In this case, firms may try to use regulation as a competitive weapon; firms' regulatory investments in this case are rivalrous, not cooperative.
The observation that firms within an industry may differ sufficiently that their interests concerning a particular regulation are not always convergent has also been made by Stigler in his discussion of the free rider problem. (Stigler, 1974) In that piece, however, Stigler focuses on the possibility that different kinds of firms may enter a coalition in an attempt to fashion a regulation which will simultaneously serve all of the firms in that coalition; regulatory investments are cooperative even in the face of firm diversity. In this paper, I focus instead on regulatory rivalry produced by firm diversity.

In the case of rivalrous regulatory investments, the firm may encourage passage of a regulation which reduces industry demand or increases industry costs. The firm may encourage such regulations because they differentially damage its rivals, and thus rearrange market shares at the same time they reduce the total market. To go one step further, the firm may even encourage a regulation which lowers its short-term profits if that regulation simultaneously reduces the ability of its rivals to effectively compete. In this case, there are some links between the discussion of rivalrous regulatory investment and the limit pricing literature. In the limit pricing discussion, the firm may find it profitable in the long run to set a low price in order to prevent entry and protect its long-run position. Regulatory investments may be used similarly. Of course the regulation case is a bit more complicated since regulations may themselves affect barriers to entry.
A simple model may be used to illustrate this process. This model was motivated by the specifics of the case studies which follow in Section 2 of this paper, but is believed applicable to a wide range of situations. Suppose we have an industry which produces two similar products, \( Q_1 \) and \( Q_2 \). There are two sub-groups in the industry: group \( m \) produces both \( Q_1 \) and \( Q_2 \), while group \( n \) produces only \( Q_2 \). In the Caves-Porter terminology, we may suppose there are insurmountable barriers to mobility facing the \( n \) group.

The full model is summarized in Table 1. Demand is modeled quite simply. There is an industry demand curve for each good type, which is linear in own price and in the price of the other good. This demand curve may be derived from a quadratic utility function in the two goods. The two goods are substitutes where \( V \) is a measure of the cross-price elasticity. Cost functions are the same for the two sub-groups, although by assumption the "\( n \)" groups produce no \( Q_1 \). To make the problem simpler, I have assumed that \( Q_1 \) and \( Q_2 \) are equivalent in terms of production costs to the \( m \) firm.

In the original pre-regulation case the \( m \) firm acts as a price-discriminator. The firm faces two demand functions with different elasticities and chooses output of each good to maximize profits. Suppose the government now considers a regulation which will encourage substitution between goods. In general, a good deal of current consumer regulation can be interpreted as having the effect of altering the cross-elasticity of demand between the different varieties of goods within a market by changing the information consumers have about the attributes of the particular goods,
or indeed by directly altering the range of goods available. This characterization applies to both of the case studies which follow in Section 2.

In terms of the simple model given here, increasing substitution between goods involves increasing \( V \). Increasing \( V \) by itself, however, also effectively shifts in the demand curve for each of the two goods. Thus increasing \( V \) reduces aggregate demand for the goods. Some reduction in aggregate demand as \( V \) increases may be plausible if we believe that product differentiation increases market demand. Reduction by the full \( V \), however, seems implausibly large. One alternative is to consider compensating changes in the intercepts as \( V \) changes. The appropriate normalization is not obvious. In characterizing the regulated regime, I adopted one example of a simultaneous \( a, V \) change. In this case I have dropped the \( V \) term, and summed the two demand curves to create a market demand curve. So that we have moved from a case of two goods which are partial substitutes to perfect substitutes; the demand function is now \( I \) in Table 1. Regulation removed the option of price discrimination. Firms can invest in activity \( (I) \) to change the probability that this regulation will occur. Each firm, then, chooses \( Q \) and \( I \) to maximize expected profits, given the regulatory uncertainty. Firm "m", for example, chooses \( Q_1 \) and \( Q_2 \) such that

\[
1. \quad p \frac{\partial E}{\partial Q} + (1-p) \frac{\partial NE}{\partial Q} = 0
\]

where \( E_R \) and \( NE_R \) are profits in the regulated and unregulated state respectively. Similarly, \( I_m \) is chosen such that

\[
2. \quad \frac{\partial p}{\partial I_m} (E_R - NE_R) = \frac{\partial c}{\partial I_m}
\]
In the case at hand, \( \frac{\partial \pi}{\partial \mu} < 0 \); positive investment by \( \mu \) decreases the probability of regulation. Since the regulation removes the possibility of price discrimination, post regulation profits will be less than pre-regulation profits for the \( \mu \) firm; equation 2 tells us that \( \mu \) has an incentive to invest in positive \( \mu \).

The \( \mu \) firms face an equivalent problem, except that \( \mu \mu > \mu \mu \). The \( \mu \) firms gain from the regulation, since they can now share in serving the inelastic demanders once served solely by the \( \mu \) firm. The optimal \( \mu \) is thus negative. The potential for inter-firm rivalry in lobbying efforts is clear.

In order to solve the problem represented in Table 1, some assumptions must be made about the interaction among firms; in particular, how does a firm's investment and output strategy depend on the strategies chosen by the other firms? Firms are connected in several ways: through the market demand functions, through the probability of regulation equation, and through the cost of regulation equation. In the simulation experiments reported in Table 2, I assumed firms were non-cooperative in output and investment. There is one "\( \mu \)" firm and one "\( \mu \)" firm. This simplifies the problem but still captures the major features of interest in the model.

It is interesting to consider what happens to our sub-groups when we change some of the parameters of the model. In case 2, the cost to \( \mu \) of making regulatory investments was decreased. As a result, \( |\mu| \) increased, and the probability of regulation increased. Firm \( \mu \) did respond by increasing its own investment, \( \mu \mu \), but this was not sufficient to offset the increased activity by \( \mu \). This change in
Table 1. A Simple Model of Strategic Investment

Given Industry Sub-groups

<table>
<thead>
<tr>
<th>Industry Demand</th>
<th>No Regulation</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) $P_1 = a_1 - b_1 Q_1 - V_1 Q_2$</td>
<td></td>
<td>$P'_1 = \frac{a_1 b_1 + a_2 b_2}{b_1 + b_2} - \frac{b_2}{b_1 + b_2} (Q_1 Q_2)$</td>
</tr>
<tr>
<td>2) $P_2 = a_2 - b_2 Q_1 - V_1 Q_2$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Costs

3) $C_i = c(Q_{1i} + Q_{2i})^2 + h(Q_{1i} + Q_{2i}) + I$

Probability of Regulation Equation

4) $P = \frac{b_0 + I c + s I n}{1 + e}$

Costs of Regulation

5) $R_i = \frac{f_i I^2}{2} - f_i I n I c + Z$

where superscripts $m$ and $n$ denote membership in the $m$ or $n$ group, $i$ denotes firm $i$.

$Q_1$ = quantity of good 1

$Q_2$ = quantity of good 2

PR = price after regulation

$P_1$ = price of good 1

$P_2$ = price of good 2

$P$ = probability of regulation occurring

$r$ = effectiveness of firm $m$'s lobbying effort

$s$ = effectiveness of firm $n$'s lobbying effort

$I$ = investment by firm in lobbying

$C$ = production costs

$R$ = investment costs
Case Characteristics

Case 1
Base Case

Costs: \( c = 2, \ H = 1, \ L = 20 \)

Demand Functions

\[ P_1 = 100 - 4 (Q_1) - .5 (Q_2) \]
\[ P_2 = 70 - 3 (Q_2) - .5 (Q_1) \]

Benefits + Costs of Anti-Regulatory Investment

\[ G = 2 \]
\[ G_n = 4 \]
\[ r = s = 1 \]
\[ f = f_n = .5 \]
\[ Z = 5 \]

Case 2
Same as 1, but \( G = 1.8 \)

Case 3
Same as 1, but \( G_n = 3.6 \)

Case 4
Same as 1, but \( A_1 = 120 \)

Case 5
Same as 1, but \( f = f_n = 0 \)

Case 6
Same as 1, but \( \ln \) is constrained to = 0
<table>
<thead>
<tr>
<th>Experiment</th>
<th>Q1M</th>
<th>Q2M</th>
<th>Q1M</th>
<th>Q2M</th>
<th>lM</th>
<th>lM</th>
<th>P1</th>
<th>P2</th>
<th>PR</th>
<th>mm</th>
<th>mm</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Base Case</td>
<td>7.03</td>
<td>1.46</td>
<td>5.23</td>
<td>0.44</td>
<td>2.80</td>
<td>-2.57</td>
<td>65.51</td>
<td>42.46</td>
<td>56.21</td>
<td>317.65</td>
<td>185.79</td>
<td>.49</td>
</tr>
<tr>
<td>2) Decrease the cost of Regulatory Invest to &quot;n&quot;</td>
<td>7.04</td>
<td>1.47</td>
<td>5.20</td>
<td>0.46</td>
<td>2.92</td>
<td>-2.73</td>
<td>65.47</td>
<td>42.40</td>
<td>56.17</td>
<td>315.23</td>
<td>185.72</td>
<td>.51</td>
</tr>
<tr>
<td>3) Decrease the cost of Regulatory Investments to &quot;m&quot;</td>
<td>7.01</td>
<td>1.44</td>
<td>5.28</td>
<td>0.42</td>
<td>3.11</td>
<td>-2.58</td>
<td>65.04</td>
<td>42.62</td>
<td>56.34</td>
<td>319.61</td>
<td>161.55</td>
<td>.43</td>
</tr>
<tr>
<td>4) Increase Demand for Q1</td>
<td>9.67</td>
<td>.22</td>
<td>43.96</td>
<td>0.66</td>
<td>3.12</td>
<td>-3.37</td>
<td>77.09</td>
<td>44.52</td>
<td>63.06</td>
<td>445.64</td>
<td>107.48</td>
<td>.18</td>
</tr>
<tr>
<td>5) No Interaction Effects in Investment costs</td>
<td>7.62</td>
<td>1.45</td>
<td>5.26</td>
<td>0.43</td>
<td>3.16</td>
<td>-2.74</td>
<td>65.58</td>
<td>42.54</td>
<td>56.20</td>
<td>319.47</td>
<td>185.04</td>
<td>.46</td>
</tr>
<tr>
<td>6) Firm n cannot invest</td>
<td>7.51</td>
<td>1.36</td>
<td>5.52</td>
<td>0.31</td>
<td>1.82</td>
<td>0</td>
<td>66.12</td>
<td>43.24</td>
<td>56.81</td>
<td>348.73</td>
<td>176.62</td>
<td>.17</td>
</tr>
</tbody>
</table>
investment activity had a secondary effect on the output side: given the increased probability of regulation, the \( m \) firm shifted production away from \( b \) goods. A similar effect is observed in Case 3: \( m \) increases its investment in response to the cost decrease, the probability of regulation declines, and production is shifted towards the \( Q_1 \) good.

In case 4, the market demand for \( Q_1 \) has been shifted to the right. This increases the gains available to \( m \) from its pre-regulation discriminatory policy. Production by \( m \) is shifted drastically towards the good 1 and \( Im \) increases. It is interesting to note here that firm \( n \) loses from the change, while \( m \) gains in terms of profits.

In the first four cases, I have assumed that a firm's regulatory costs are affected by its rival's actions. In particular, if \( Im \) and \( In \) are of opposite signs, as they are here, increases in the rival's investment increase a firm's regulatory costs. In case 5, these interaction effects are eliminated. As a result, both firms increase their investment.

Finally, in case 6, I have constrained from \( n \)'s investment to equal 0. Absent this investment rivalry, the optimal \( Im \) falls, \( p \) decreases, and production is shifted towards good 1. In terms of profits, \( m \) gains and \( n \) loses from the change. It is interesting to note that in this particular case, \( m \) gains more from the constraint than \( n \) loses. This suggests that there is at least the possibility that \( m \) can bribe \( n \) to restrict its regulatory investment.
Clearly the quantitative results in Table 2 are closely tied to the simple functional forms chosen. But I think the simulations do illustrate some of the characteristics of industry behavior under situations in which sub-groups use the regulatory apparatus to compete. The role of the simulations is simply to indicate that under plausible parameter values, strategic regulatory investments may occur, and to indicate the effect of changing the parameter values on the level of this investment.

The scope for firm behavior of this sort is fairly large. The benefits to a firm from restriction of entry into new markets (in transportation, for example) clearly depend on what markets the firm controls when the restriction is imposed. The costs associated with meeting environmental standards vary with the capital equipment of firms. The effects may be more subtle. Much of the Federal Trade Commission's current interest is in regulating advertising. But the losses from advertising restrictions will clearly not be equally felt by all firms even within particular industries. As indicated earlier, Porter suggests that "follower" firms gain less in terms of profits from advertising than do "leader" firms (Porter, 1979); thus restrictions will impose different costs on the firm sub-groups. Given this, one might predict an industry battle over government advertising restrictions.

Firms clearly recognize the potential described in Table 2 for manipulating the environment to enhance market shares. A recent piece on modern business practices argues:

"Any organization has a responsibility for planning and managing its relationships with all those involved in or affected by its activities, or with those who, in turn, can affect the ability of the organization to operate effectively and achieve objectives." (Hargreaves and Darrow, 1975, p.239)
The propensity of firms to try to manipulate the regulatory environment may, of course, vary widely across industries. Industries which have had long historical experience with government regulation are likely to be more apt at this process than the newly regulated. There has in recent years developed a small body of evidence that suggests that firms may in fact be manipulating the regulatory environment to increase market shares. Hunt in a study of self-regulation in the appliance industry argues that full-line producers benefit considerably more from the imposition of standards in the industry than single-product firms. (Hunt, 1975) Brock, in a study of the computer market, argues that for the computer manufacturer, "the value of standards depends on his competitive position;" and, moreover, that the pattern of support for standards observed in the industry is consistent with the competitive self-interest of the firms involved. (Brock, 1975, p. 78) In an earlier paper, I argue that a series of state laws controlling the construction and sale of mobile homes have influenced the structure of the mobile home industry within these states. (Oster, 1979) In particular, low quality and/or small firms are forced out of the market, while large and/or high quality firms improve their market shares. A subsequent article in the Washington Post argues similarly, "companies in the industry are thankful that government regulation gave them credibility at a time when fly-by-night companies had been hurting the reputation of the entire industry." (April 19, 1979)

In the next section of this paper, I consider two recent FTC rules as examples of strategic regulatory activities.
II. **Federal Trade Commission Rules**

Since the Magnuson-Moss Dill was passed in 1975, the Federal Trade Commission has issued a series of trade rules aimed at changing particular industry-wide practices. This represents a change from the earlier pattern of attacking firm practices. With these industry rules, there is the potential for the kind of differential sub-group effects I discussed in Section I of this paper. In this section, I consider two industry rules: the eyeglass rule and R-value insulation rule. For each rule, I consider the way the rule impinges on different groups within the industry, and then review the staff report to identify the reaction of industry sub-groups to the rule.

**Eyeglass Rule**

Beginning in the 1930's a number of states banned price advertising of eyeglasses. There is some evidence that the primary group fostering these bans were individual optometrists and opticians concerned about the growing competition from chain stores (FTC report, 1976). Indeed, the 1934 president of the Northern Illinois College of Optometry argued,

"As I see it there is one direct way to whip the corporate practice menace in optometry, and that is to make price advertising illegal." 

(cited in FTC, 1976)
One way to view the original state rules against advertising is as a weapon against a new entrant into the industry. As it turned out, this weapon was not sufficient; commercial, large-scale firms entered the industry anyway. In 1948, only .2% of optical stores had more than 50 employees; by 1972 this number had risen to 4%. By the early 1970's, then, we have a clear case of an industry with sub-groups: one and two person operations versus large-scale, generally chain, operations.

Early in 1976, the Federal Trade Commission proposed a rule which would eliminate existing private and public restrictions on advertising eyeglasses. This rule was one of several designed to eliminate advertising restrictions in a broad range of goods and services: drugs, dentists, veterinarians, accountants, funeral directors, lawyers, doctors and so on. The final eyeglass rule was passed in 1976. Subsequent decisions in the court have invalidated the FTC rule, on the grounds that it attempts to preempt state laws. At present the FTC rule is no longer in effect, however, it is still interesting to consider the forces behind this rule.

We have an industry with clear sub-groups. Moreover, movement between the two groups is restricted: transforming a two-person operation to a large commercial venture requires at the least some substantial capital investment. Finally, there is evidence that the rule affects different groups in the industry differently.

Price advertising has two effects on an industry. First, by improving consumer information, price advertising can increase market demand for the good. Price advertising may be thought of as reducing the expected price of a good. The overall market for eyeglasses will increase in response to this price fall, depending on how elastic that market is. The demand
for eyeglasses does not appear to be elastic, so overall, the market for eyeglasses is not likely to increase substantially as a result of the rule. The larger result from the rule is likely to be to rearrange market shares among the firms in the industry; in particular to shift business towards the low-price deliverers. Survey evidence indicates that high volume outlets charge less than individual opticians and optometrists. (New York City survey, cited in FTC, 1976) This conclusion is also supported by Benham's econometric evidence which indicates that the average price of eyeglasses in a state varies inversely with the market share of commercial firms. (Benham, 1975) In terms of the analysis in section I of this paper, we can interpret the rule as shifting the demand curves of the two types of firms towards the high-volume operation.

There is evidence in the testimony before the FTC that the industry recognized the potential reallocation effect of the rule. Attorney's representing the California and Washington Optometrists Associations both argued that the rule would "favor the large commercial providers of ophthalmic goods and services at the economic expense of the individual or professional practitioner." (FTC, 1976, p.65) Indeed, as indicated earlier it was the recognition of the edge that the high volume outlets had in price that led opticians initially to push for advertising bans. Once again Benham's results are interesting. Benham finds states which are restrictive in their laws governing optometry also have fewer commercial firms. (Benham, 1975) This conclusion has two possible interpretations. Either restrictions change industry structure within a state towards fewer commercial firms, or else states with more commercial firms are led through the political process to
levying fewer restrictions on these firms. In either case, there is in this industry a clear relationship between industry structure and the regulatory structure.

**Insulation**

Fuel price increases in the 1970's resulted in a rapid increase in the demand for home insulation. In the view of the Federal Trade Commission, many of these purchases were being made without very good information about the characteristics of the various kinds of insulation (FTC, 1978). Insulation may be characterized as an experience good, which is purchased once and for all; this is a classic case in which lack of information may create difficulties.

In response to perceived consumer purchasing problems, the FTC proposed an insulation rule in November 1977. The final rule was originally scheduled to take effect November, 1979. As a result of a series of industry and congressional battles, however, the rule has not yet been instituted.

The original insulation rule, also called the R-value rule, had two main provisions:

1. Insulating information must be disclosed in certain advertisements and at the sale of insulation. Included must be information on the R-value of the insulation; the R-value is a summary measure of the ability of the material to resist heat flow.

2. R-values must be determined according to standard testing procedures. Moreover, R-values must be determined either at a product's installed or "representative" thickness.

It is this second provision that has led to active sub-group rivalry within the industry.

There are three main types of insulation: mineral wool, including fiberglass and rock wool; cellulose; and foam. fiberglass insulation accounts for about 80% of the insulation sold, and is produced almost entirely by three firms: Owens-Corning, Johns-Manville and Certainteed Corporation. The fiberglass producers along with the six producers of rock wool insulation
belong to the National Mineral Wool Insulation Association, a trade association which has represented the views of this segment of the industry in the FTC hearings.

Cellulose firms are the second largest source of insulation. Cellulose insulation is made chiefly from waste newspapers. The industry is very easy to enter, needs little capital and uses easily obtainable raw materials. Indeed, there are in some areas portable "cellulose manufacturing plants", which can be purchased for as little as $7,000. (FTC, 1978)

As a result of these characteristics, there are many small firms in this industry group; the FTC estimates that in 1979 there were 200 manufactures in the cellulose group with 10-12 new firms entering each month. There are two trade associations representing this group, but neither one has more than a small fraction of the firms in the group.

The foam, or cellular plastic group, has a very small market share, and is primarily useful in insulating the walls of existing homes. The group consists of four major manufactures and many smaller firms.

The industry is thus divided based on product type. As noted, there are separate trade associations for each of the sub-groups. Moreover, entry into the fiberglass part of the industry--either by outsiders or by members of one of the other groups is quite difficult, given the dominance of the three large firms. It has been estimated that it would take 10 years and $80 million for a new firm to enter this industry with just one manufacturing plant, given the current patent protection and economies to scale in this segment of the industry. (The Economist, July 9, 1977). Not only are there substantial mobility and entry barriers, but the FTC rule has differential effects on different groups of firms within the industry.

In the original FTC rule, any one of three methods approved by the American Society for Testing and Materials could be used to establish the R-value of particular types of insulation. The tests had to be
performed, however, at the "representative thickness" of the materials; firms could not test 1 inch samples and then extrapolate as had been past practice. The FTC argued that as low density insulation gets thicker, its R-value per unit falls; hence simple extrapolation overstates the R-value of low density materials. Prohibiting this extrapolation policy has the greatest effect on fiberglass producers. In this case, the fiberglass group will suffer a differential shift in the intercept of the demand curve which it faces. The R-value ratings of fiberglass are reduced more by the representative thickness method than are the ratings of firms in the other two groups in the industry. (FTC, 1976)

The fiberglass industry has been quite active in its opposition to the FTC rule. The industry trade association took the Commission to court, and simultaneously lobbied Congress to try to change the testing procedure. The particular focus was on the representative thickness requirement; the fiberglass firms argued that this requirement was technically infeasible.

The cellulose sub-group has been actively supporting the FTC rule, although as noted earlier, this group is somewhat less well-organized. The trade association of cellulose manufactures argued recently, "Most small businessmen are opposed to over-regulation. But this is one time we feel government should carry forward." (Lempert, 1980)

At the present time, the controversy in the insulation industry remains unresolved. But the industry rivalry over the characteristics of the rule continue. And this is as we would expect, since all of the conditions for strategic regulatory rivalry exist: the industry contains sub-groups with substantial mobility barriers; substitution across sub-groups is significant, while substitution to other industries is small.
III. Conclusion

In this paper, I have been concerned with the differential effect which regulations may have on various sub-groups within an industry, and the role which the regulatory process may have on various sub-groups within an industry. We have seen that a firm's incentives to engage in strategic regulatory investments depend on the nature of the proposed regulation, substitution possibilities both within and outside the industry, and barriers to entry and mobility. The analysis in this paper is as yet somewhat exploratory, but the work does suggest that the scope for strategic regulatory investments may be substantial.
References


