Joint Ventures in the Semiconductor Industry, 10 Computer L.J. 581 (1990)

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JOINT VENTURES IN THE SEMICONDUCTOR INDUSTRY

In response to growing concerns about the future of the United States semiconductor industry, the United States Congress established the National Advisory Committee on Semiconductors as part of the National Advisory Committee on Semiconductor Research and Development Act of 1988.1 The purpose of this advisory committee was to analyze the problems facing the U.S. semiconductor industry, and to report these findings to the President and to Congress. In addition, the advisory committee was to formulate recommendations as to how Congress should address the problems facing this industry.2

One of the recommendations made by the Committee was to make some changes in the current antitrust laws in an attempt to improve the business environment. Specifically, the Committee recommended that Congress enact "[l]egislation to facilitate Production Joint Ventures, as the 1984 National Cooperative Research Act (NCRA) facilitated R&D joint ventures such as the Semiconductor Research Corporation and SEMATECH, [which] would help to strengthen the U.S. presence in strategic infrastructure electronics industry sectors and thereby bolster American competitiveness."3 The Committee also recommended that courts apply the "rule of reason" analysis rather than a "per se" analysis to production joint ventures under this new legislation.4 Also, the Committee proposed a rule whereby so long as the joint venturers had given notice of the venture, the courts would limit any liability for antitrust violations to actual, not treble, damages.5

On May 7, 1990, the Bush Administration introduced a proposal "to loosen antitrust laws so that companies can more easily form joint manufacturing ventures."6 The proposal was made as an effort to help United States companies compete more effectively with foreign competitors, especially in high technology areas. The Bush Administration proposal would have two important effects on the antitrust laws. First,
it would make it difficult for a competitor to challenge a joint venture as a violation of the antitrust laws.\textsuperscript{7} Second, it would limit the amount of damages for an antitrust violation to actual, rather than treble damages.\textsuperscript{8}

Because both the Bush Administration's proposal and the National Advisory Committee's recommendation are primarily directed towards benefiting the semiconductor and other high technology industries, this Note will analyze the semiconductor industry to determine if there is anything unique about this industry which would suggest that a joint venture between two firms in this industry should be treated differently under the antitrust laws than joint ventures in other industries. If nothing is unique about the semiconductor industry, any proposed changes in the antitrust laws should not be directed at this specific industry as recommended by the National Advisory Committee; rather, they should be equally applicable to all industries.

I. BACKGROUND OF THE SEMICONDUCTOR INDUSTRY

The semiconductor has quickly become an essential element of many people's daily lives. These chips are currently being used in a wide variety of products, including sophisticated military weapons, state of the art medical diagnostic equipment, and commercial aircraft navigation equipment. In addition, semiconductors are used in many consumer and business oriented products, such as computers, televisions, phone systems, and automobiles.\textsuperscript{9} As semiconductor production technology continues to become more advanced, and the cost of production declines, semiconductors will be used in even more new products.

Today, the global market for semiconductor chips amounts to $50 billion annually.\textsuperscript{10} In addition, these chips are the heart of the $750 billion global market for electronics products.\textsuperscript{11} The market share held by United States semiconductor chip manufacturers, however, has declined substantially since the early 1980's despite the growing demand for semiconductors. In 1981, United States companies held 57\% of the global semiconductor market, but by the end of 1989 this market share had slipped to approximately 38\%.\textsuperscript{12} By contrast, the market share of Japanese firms has risen to approximately 51\%, up from 33\% in 1981.\textsuperscript{13}

This shift of semiconductor manufacturing to Japan is creating a
considerable amount of concern among some people in the United States. These people argue that the semiconductor industry is vital to the national economy. They argue that semiconductors are the key to the entire electronics industry, an industry which employs 2.6 million American workers. These people also contend that the technology required to produce semiconductors often transfers over to other industries, thereby improving their productivity and competitiveness.

One possible method to revitalize the United States semiconductor industry would be to establish production joint ventures between United States semiconductor firms. In June, 1989, seven United States corporations formed a joint venture named U.S. Memories partly for this purpose. U.S. Memories was intended to manufacture new state-of-the-art four-megabyte Dynamic Random Access Memory (DRAM) chips which no other United States corporations were then making. U.S. Memories was a particularly unusual joint venture in that it involved several of the largest computer related corporations in the United States, including the three largest computer manufacturers, IBM, Digital Equipment Corporation, and Hewlett-Packard Co. These three corporations would likely have been the primary users of the memory chips produced by the joint venture. The other corporations involved in the joint venture were semiconductor manufacturers, although none of them were then producing DRAM memory chips of any size. U.S. Memories subsequently failed to obtain sufficient financing to begin production, and consequently was dissolved on January 15, 1990.

Although this joint venture failed, other joint ventures are likely to occur in the future. However, joint ventures such as U.S. Memories raise concerns about the possibility of antitrust violations, especially if they involve large competing firms. Consequently, firms may be hesitant to enter a production joint venture because of the risk of violating the antitrust laws.

II. THE ANTITRUST LAWS OF JOINT VENTURES

Joint ventures are subject to the general antitrust law provisions of the Sherman Act, the Clayton Act, and section 5 of the Federal Trade

14. SEMICONDUCTOR REPORT, supra note 1, at 5-7.
15. SEMICONDUCTOR REPORT, supra note 1, at 5.
16. SEMICONDUCTOR REPORT, supra note 1, at 7.
18. Id.
19. Id.
Commission Act. However, the majority of the litigation over joint ventures occurs under the Sherman Act. Courts have not always consistently applied a single method to analyze joint ventures, though they have generally been permissive in allowing them. Under prevailing law, the Rule of Reason standard is the most commonly used approach. Courts have also used per se rules against joint ventures as well as the Penn-Olin potential competition standard as alternatives to the Rule of Reason approach.

A. PER SE RULES

At times the courts have applied per se rules of illegality to some types of joint ventures. From 1940 through the mid-1970s, the Supreme Court adopted many near-conclusive presumptions to conclude that joint ventures were anticompetitive. Joint ventures which involved "price-fixing, market allocation, tying agreements and boycotts were either condemned outright or the available defenses in support of their use were severely limited." The Court preferred per se rules in these situations because they created legal certainty as to when a joint venture would be considered anticompetitive. Also, the presumptions helped to make the judicial process less costly. In the Court's view, these advantages outweighed any loss of efficiency in prohibiting a joint venture which may not have had anticompetitive effects. Since the mid-1970s, however, the courts have strayed away from the per se rules and are now generally more receptive to the potential efficiencies of a joint venture.

B. THE POTENTIAL COMPETITION STANDARD

Another approach which the Supreme Court has used to analyze joint ventures requires the court to assess the effects of the joint venture on potential competition. In United States v. Penn-Olin Chemical Inc., the Court reviewed the legality of joint ventures under the

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26. The potential competition standard is discussed here as a separate standard, although it is not clear that the standard is different from the Rule of Reason. The reason this standard is discussed as a separate standard is that historically, many commentators considered this to be a separate standard. The Supreme Court may have originally intended it to be a separate standard, but the more recent cases indicate that the Court has backed away from employing a potential competition analysis and instead favors a Rule of Reason analysis.
Clayton Act by applying a two-part analysis of potential competition. In the first part of the analysis, the court must determine whether the parent firms are potential competitors in the joint venture's market. If they are potential competitors, then their entry as a joint venture would reduce the competitive benefits of individual entry by both firms.\textsuperscript{28} If the firms are found to be potential competitors, the second part of the analysis requires the court to determine "whether the joint venture is likely to injure competition."\textsuperscript{29} 

The \textit{Penn-Olin} standard of competition has been criticized by many commentators as being an ineffective standard by which to evaluate joint ventures.\textsuperscript{30} One problem with the standard is that the court would have to determine whether a firm was a potential competitor. To prove that a firm was a potential competitor would be extremely difficult. Another problem is that even if the firm were to be considered to have been a potential competitor, the court would still have to determine what effects the joint venture would have on competition. This determination would likely have to be made under a Rule of Reason analysis, which again leads to considerable uncertainty as to the outcome. It is most likely for these reasons that the potential competition standard has had limited application by the courts.

\textbf{C. RULE OF REASON}

Under the Rule of Reason, a court will generally analyze the structure of the joint venture, and consider the conduct and intent of the parent firms. The court will then evaluate the potential anticompetitive effects of the joint venture to determine whether it unlawfully restrains trade. In \textit{Berkey Photo, Inc. v. Eastman Kodak Co.},\textsuperscript{31} the Second Circuit specified the relevant variables which should be considered when making a Rule of Reason inquiry. The court should consider:

- The size of the joint venturers; their share of their respective markets;
- the contribution of each party to the venture and the benefits derived;
- the likelihood that, in the absence of the joint effort, one or both parties would undertake a similar project, either alone or with a smaller firm in the market; the nature of the ancillary restraints imposed, and
- the reasonableness of their relationship to the purposes of the joint venture.\textsuperscript{32}

Despite these relevant variables, it is difficult to predict the final outcome of a close case involving the Rule of Reason. The outcome will depend upon a complicated set of facts which the court will have to

\textsuperscript{28} Brodley, supra note 23, at 1537.
\textsuperscript{29} Brodley, supra note 23, at 1537.
\textsuperscript{30} See, e.g., Brodley, supra note 23, at 1537-38.
\textsuperscript{31} 603 F.2d 263 (2d Cir. 1979), cert. denied, 444 U.S. 1093 (1980).
\textsuperscript{32} Id. at 302.
carefully scrutinize. The costs of this type of proceeding would be very high, and this may be a factor which explains why many joint ventures are permitted without objection.33

III. ANALYZING JOINT VENTURES UNDER THE RULE OF REASON

A. PROCOMPETITIVE BENEFITS OF JOINT VENTURES

To properly analyze a joint venture under the Rule of Reason, one must understand the reasons why firms enter into joint ventures instead of selecting alternative methods of achieving their desired results. While a joint venture will enable a firm to either increase its production capacity or enter into a new market, a firm also has other options available, such as merging or expanding internally.

In a general sense, a firm which is considering entering a joint venture is seeking some form of input, such as new technology, expanded production capacity, or marketing expertise. A joint venture is just one method of obtaining the desired input. The primary alternatives to a joint venture to gain these inputs would be to merge with a firm possessing the input, or to seek additional capital to finance the acquisition of the input from within the firm. After considering the advantages and disadvantages of each option, firms will most likely select the option that best achieves their goals, such as obtaining a specific market share or entering a new market.

Because there are several alternative ways in which a firm can obtain a desired input, one may wonder why a firm would choose to become involved in a joint venture. Probably the primary reason why a firm chooses to enter into a joint venture rather than to merge with another firm is so that the parent firms may continue their independent existences. If the joint venture is intended to be only temporary in nature, or involves only a small part of a much larger corporation which has no desire to merge entirely with another corporation, the joint venture creates many of the same advantages as a merger, but allows the parent firms to maintain their separate identities.

The other alternative to a joint venture is for the firm to raise additional capital to finance the firm's own efforts to obtain its desired input. This option will normally be achieved through the issuance of either debt or stock. However, to many firms, neither of these options may be appealing. If the financial position of a firm is unsound, the firm will have to pay investors a high rate of interest on the debt to compensate for the high risk, assuming that there would even be enough investors willing to take the risk. The result of this could be

that the costs of obtaining the input far exceed the benefits to be achieved. As for the issuance of additional stock, the firm’s shareholders may be unable or unwilling to invest more of their own money into the corporation, and they may not desire for their control of the corporation to be diluted by selling new shares. Under these circumstances, use of the joint venture form may avoid the issuance of further stock, thereby preventing the dilution of shareholder control.

Joint ventures may also be able to achieve other additional advantages that are quite significant as well. The first, and probably most important of these is the opportunity to benefit from economies of scale.34 For many industries, the size of the production facility can have a substantial impact upon the cost of producing an item. Generally, at a given state of technology, there is an optimum size for a production facility at which the facility will produce the product at the lowest cost possible. In a situation such as this, a joint venture may allow two firms to combine their production, enabling them to benefit from a new and more efficient level of production. This gain in efficiency not only benefits the participating firms by reducing their production costs, but also may lead to a lowered selling price which may benefit the consumers of the product as well.35

A second reason why a firm may enter a joint venture is to receive the benefit from an "experience curve."36 As a firm gains more experience in producing a product, the production cost will generally decrease over the production period of the product. This normally occurs because, as the firm gains experience in producing the product, the firm will find better methods of producing the product, and will probably make fewer mistakes when producing the product. Where one firm has significantly more production experience than the other, use of the joint venture allows a firm to immediately gain the advantages of the other firm’s experience.37

A third reason why firms may choose to enter a joint venture is “to spread the risks of a new industrial development.”38 In some situations, a firm may decide that the development of a product is too risky to undertake alone. But, if the firm can find a partner, or a co-venturer, to help absorb any losses if the project fails, then the firm may decide that this lower level of potential loss is acceptable and pursue the project.

A fourth reason for a firm to enter into a joint venture would be

35. Id.
36. Id.
37. Id.
“to circumvent market imperfections.” A firm may desire certain resources which are not always available through the free markets. For example, the latest technology is often not available to a firm because a patent has been granted to the firm that developed the technology. In situations like this, where one firm has a unique capability unavailable to other firms, a joint venture allows the firm without this ability to gain access to it. Further, when firms each possess a complementary capability, the combination into a joint venture can have very positive results for both firms.

Each of these reasons for forming joint ventures have focused on the economic benefits that may be achieved by forming a joint venture. These are the reasons most frequently advanced as to why joint ventures should be permitted rather than prohibited by the antitrust laws.

B. ANTIMCOMPETITIVE RISKS

While significant benefits may be obtained through forming a joint venture, there are also some anticompetitive risks involved. Generally, these anticompetitive risks can be divided into three types. First, there is the risk of collusion. Second, there is the risk of lessening potential competition. Third, there is the risk of creating barriers to access. All of these may have the effect of reducing competition between firms.

1. Collusion

The first type of anticompetitive risk from a joint venture is the risk of collusion. Collusion occurs when the joint venture's parent firms agree, either explicitly or implicitly, to arrange their affairs so as to not have to compete vigorously with each other. While negotiating the terms of the joint venture or during the operation of the joint venture, the parent firms will have an opportunity to discuss ways of affecting competition. They may agree on sales prices for products not being produced by the joint venture which may lead to higher than competitive prices. Further, as a part of the operation, the firms may agree to share other information relating to future prices, productive capacity, or sales volume. This information may have anticompetitive effects by affecting the product decisions that the parent firms make.
A joint venture also increases the risk of collusion through its requirement of cooperation by the parent firms. The joint venture creates a means of enforcing "cartel law," because a firm which refuses to cooperate can be effectively punished by the other firms which will refuse to provide the cooperation necessary to operate the joint venture. Consequently, to keep the joint venture functioning, all of the firms will cooperate with each other. Furthermore, the joint venture also provides a means of detecting breaches of the "cartel law," since the parent firms will likely share data through the joint venture.\(^4\)

There are many conditions which create an environment conducive to collusion. According to Richard Posner, these conditions can be used to identify industries in which firms are likely to engage in collusive practices. Under some market conditions, for example, the exchange of price information may be very likely to lead to collusion, but under market conditions less favorable to collusion this same exchange of information may not be as dangerous.\(^4\)

The first condition favorable to collusion is high concentration among sellers.\(^4\) One means of analyzing the concentration of firms uses the Four-Firm Concentration Ratio ("CR4") as an index. The CR4 sums the market shares of each of the four largest firms in the industry.\(^4\) However, economists do not agree about the level of concentration at which collusion becomes a serious concern. Some economists would become concerned when the four largest firms controlled 40% of the market, while others would not become concerned until the four largest controlled 70-80% of the market.\(^5\)

An alternative to the CR4 is the Herfindahl-Hirschman Index ("HHI"). The HHI sums the squares of the market shares of all the firms in the market.\(^5\) Many economists consider the HHI to be a better index for evaluating the concentration of firms than the CR4, as it gives more weight to the shares of the largest firms without imposing any artificial limit on the number of firms whose shares should be summed. The HHI was adopted by the 1982/84 Merger Guidelines to be applied by the Department of Justice in evaluating mergers. The Merger Guidelines describe unconcentrated industries as those with HHI's below 1000; moderately concentrated industries as those with HHI's between 1000 and 1800; and highly concentrated industries as

\(^{46}\) Pitofsky, supra note 44, at 403; Brodley, supra note 23, at 1530-31.  
\(^{48}\) Id.  
\(^{50}\) R. Posner, supra note 47, at 56.  
\(^{51}\) E. Sullivan & H. Hovenkamp, supra note 49.
those with HHI's above 1800. 52 Regardless of which method is used to analyze the concentration of the industry, economists generally agree that as the number of sellers decreases, and the market becomes more concentrated, the risk of collusion increases. 53

A second condition favorable to collusion is the absence of a fringe of small sellers in the market. The concentration measures discussed above primarily consider the market share of the few largest firms, but ignore the rest of the market. If there were a substantial number of smaller competing firms there would be considerably less risk of collusion than if there were only a few smaller firms. 54

A third condition favoring collusion is the presence of inelastic demand at the competitive price. Elasticity of demand reflects the amount that the quantity sold will change as the result of a change in price. For example, if the demand for a product is highly elastic, each increase in price will result in a significant decrease in demand. If the demand is inelastic, an increase in price will not have as large an effect on demand, and so the additional revenue received due to the higher price would exceed the revenue lost as a result of the reduced demand. When demand is inelastic at the competitive price, the opportunities for gaining from collusive practices are maximized. The potential colluders would thus be able to raise the amount of their profits by agreeing to raise their prices. 55

In practice, however, elasticity of demand is difficult to measure. For example, it may be difficult to determine the actual competitive price because the product may already be selling at a non-competitive price. Thus, if demand is found to be elastic at the current selling price, it may mean that there is little risk of collusion, but it may also mean that collusion is already occurring. 56 On the other hand, if demand is found to be inelastic, then it is likely that firms are not colluding, or at least not colluding effectively. 57

Another condition which favors collusion is entry barriers. One possible entry barrier is when entry into the market takes a long time. Under this condition firms already in the market will have a greater incentive to collude because they will know that a considerable amount of time will pass before a new competitor can enter the market. In some industries the additional cost of a quick entry may be so prohibitively high that a firm will not rush to enter the market, even though the price is considerably above the competitive level. On a practical level,

52. E. SULLIVAN & H. HOVENKAMP, supra note 49, at 954.
53. R. POSNER, supra note 47, at 55-56.
54. R. POSNER, supra note 47, at 56.
55. R. POSNER, supra note 47, at 56-57.
56. R. POSNER, supra note 47, at 48-49.
57. R. POSNER, supra note 47, at 57.
new entry is likely to take a long time when a product requires a complicated process to manufacture and a substantial amount of organization to produce efficiently.\textsuperscript{58}

Another form of entry barrier results from sunk costs. Sunk costs in this context are costs which a firm must incur to begin to compete, but are irreversible if the firm fails.\textsuperscript{59} For example, marketing costs are often sunk costs because the marketing is unable to be put to another use. The greater the sunk costs that are required to enter a market, the greater the risk for the firm which enters. Consequently, high sunk costs will reduce the likelihood that a competing firm will enter the market even if the prices are above the competitive level.

A fifth condition which favors collusion is a large number of buyers. For effective collusion, colluding firms generally must be able to monitor the other colluding firms to ensure that none of them are cheating. Colluding firms are not likely to cheat where it is likely that they will be caught. When there is a large number of buyers, any large shift in buying from one seller to another creates a strong indication that the firm receiving the new sales may be cheating. However, if there are only a few buyers, a switch by a buyer to a new seller will not necessarily indicate that the new seller was cheating since buyers often change for other reasons. For this reason, a large number of buyers may facilitate the policing of collusive practices.\textsuperscript{60}

A sixth condition which may facilitate collusion is when firms sell a standard product. A standard product is one which is readily interchangeable with a product from another firm, although not necessarily identical. If firms are producing standard products, they are in a better position to collude on the pricing of the product. Also, monitoring the collusive practices of the other firms is easier where all products are functionally similar.\textsuperscript{61}

A final condition which favors collusion is competition based primarily on price. If price competition is the only real form of competition for a product, the firms may decide that they could earn greater profits by uniformly raising their prices rather than lowering their prices to attract their competitors' customers. This situation is most likely to occur where a product is fungible. However, if other forms of competition are important to the buyer, such as product quality, colluding on price alone may not be effective as the firms will likely spend the additional profits gained by colluding in an attempt to compete in

\textsuperscript{58} R. Posner, supra note 47, at 57-59.

\textsuperscript{59} M. Handler, H. Blake, R. Pitofsky & H. Goldschmid, Trade Regulation 240 (3d ed. 1990).

\textsuperscript{60} R. Posner, supra note 47, at 54, 59.

\textsuperscript{61} R. Posner, supra note 47, at 59-60.
These are the seven conditions this author will use in Part IV to analyze the potential for collusion in the semiconductor industry. Although Posner mentions several other factors, the ones mentioned above are the most relevant.

2. Loss of Potential Competition

A second way in which joint ventures increase the risk of anticompetitive behavior is through the loss of potential competition. Where potential competition exists, firms in the marketplace will be careful about their pricing decisions because they know that competitors may enter the market if their price rises above the competitive price. The joint venture will likely reduce the potential competition between the parent firms, or between the parent firms and the joint venture. A joint venture reduces the number of potential competitors in a market because a firm is not likely to enter a market both on its own and through a joint venture. The parent firms are not likely to compete directly with the joint venture, and the existence of the joint venture makes it less likely that one parent firm will enter into the market of the other parent firms.63

Even if a joint venture has clearly reduced the amount of potential competition, it is difficult to determine what effect this loss will have on competition. Generally, the same factors that indicate whether collusion is likely to occur are used to evaluate the effects of the loss of potential competition. However, the analysis here is more complicated than under the collusion analysis since instead of there being separate potential competitors, there will be a new actual competitor. In this situation, a difficult calculation would have to be made as to whether the elimination of potential competitors was offset by the addition of immediate actual competitors. One factor to consider would be how many firms, potential competitors, joined together in the joint venture. For example, if there were only a few firms currently in an industry and a significant number of potential competitors, and all the potential competitors created a single joint venture, the loss of potential competition could be substantial. Because of the difficulty in determining the effects that a joint venture has on potential competition, this risk alone is usually only taken in conjunction with other anticompetitive risks in assessing the overall anticompetitiveness of a joint venture.64

63. Brodley, supra note 23, at 1531-32.
64. Brodley, supra note 23, at 1531-32.
JOINT VENTURES

3. Market exclusion and access discrimination

The third type of anticompetitive risk that a joint venture poses is that of market exclusion and access discrimination. A joint venture can inhibit competition by excluding or hampering competing firms from gaining access to essential requirements.65 This anticompetitive result is most likely to occur when the parents of the joint venture have a substantial market position, and they form a joint venture which has "natural monopoly characteristics."66 Often, the joint venture will be an exclusive marketing or input supply joint venture.67 When firms can create a joint venture with these characteristics, the joint venture can potentially exclude other firms from the marketplace by refusing to deal with them.68 Alternatively, the joint venture may allow the competing firms to enter the market, but on substantially less favorable terms.69 Furthermore, the joint venture may restrict access to essential requirements, giving it the ability to enforce cartel-type laws without resorting to explicit agreements between the competing firms.70

The following hypothetical situation depicts one way in which this third type of anticompetitive risk might occur. In this situation, firm X and firm Y enter into a production joint venture. Firm X and Y both control a significant share of the market for the product that the joint venture produces. The joint venture develops a new manufacturing process which allows the joint venture to produce the product at a cost which is 1/10th the cost of its competitors. Under this scenario, X and Y can prevent their competitors from obtaining this technology (by enforcing their patent rights), thus allowing them to charge a price which is higher than what the competitive price would be if all the firms had the new technology.

However, this third anticompetitive risk does not apply exclusively to joint ventures, but can also apply where a single firm controls a vital patent. Additionally, the courts must also be careful when a joint venture has developed a new technology which gives it a significant advantage over its competitors. This type of situation creates a tension between promoting competition between all the firms and not penalizing a firm for developing a new technology which has made it successful.71 Consequently, this third anticompetitive risk should be considered cautiously when evaluating a joint venture.

66. Brodley, supra note 23, at 1531-32; see also Pitofsky, supra note 44, at 404.
68. Brodley, supra note 23, at 1531-32.
70. Brodley, supra note 23, at 1533.
IV. ANALYSIS OF THE SEMICONDUCTOR INDUSTRY

As stated previously, the purpose of this Note is to determine whether there are unique characteristics of the semiconductor industry which would justify allowing semiconductor firms to form joint ventures that would potentially be prohibited in other industries. The first part of the analysis will focus on whether joint ventures in the semiconductor industry pose the same anticompetitive risks as joint ventures in many other industries. The second and third parts will discuss whether, regardless of the anticompetitive risks that may be present, there are other characteristics which may justify treating the industry differently.

A. Analysis of the Structure of the Semiconductor Industry

This Note will now apply each of Posner's conditions favoring collusion to the semiconductor industry, and will analyze whether the condition is present within the industry. The presence of any one of these conditions tends to increase the possibility that collusion will occur within the semiconductor industry. However, the presence of any particular condition or conditions is not conclusive of the likelihood of collusion within the industry. Further, after analyzing a particular condition, it may not be clear whether the favorable condition to collusion is present or not. After analyzing each of the possible conditions individually, the conditions should then be viewed as a whole to determine whether the industry exhibits a tendency towards collusion. In some situations, several conditions favorable to collusion may be present, but there may be an offsetting characteristic which, when the conditions are viewed as a whole, may tend to indicate that collusion is unlikely to occur. The opposite situation may also occur, where few conditions favorable to collusion are present, but one condition favorable to collusion may overwhelm the other less favorable conditions. Therefore, no particular factor should be overemphasized; rather, an approach which looks at all the conditions as a whole should be utilized.

The first condition favorable to collusion is when the market is highly concentrated on the selling side. The semiconductor industry has a significant number of sellers, although they may not all sell the exact same types of semiconductors. In 1988, the top fifteen semiconductor companies had combined sales in excess of $33 billion. Toshiba had the highest sales, $4.375 billion, for a market share of 13.1%.

72. See supra text accompanying notes 48-62.
73. Top 15 Semiconductor Suppliers 1988 Worldwide Sales, Electronic News, Sep. 25, 1989, at 30. This percentage is calculated based on the dollar amount of semiconductors sold divided by the total dollar amounts sold by the top fifteen semiconductor manufacturers. Although this percentage does not necessarily correspond to the market share of a
second, third, and fourth places were held by NEC (12.4%), Hitachi (10.3%), and Motorola (8.2%).\textsuperscript{74}

Using the HHI, the analysis yields an index of 814. Applying the classifications under the merger guidelines, the semiconductor industry would be considered to be unconcentrated. There are no firms having a very substantial market share, the highest share being 13.1%. Even under the CR4, the industry would probably be considered unconcentrated, as the CR4 would yield an index of 44. Thus, it appears that, as a whole, the semiconductor industry is not concentrated.

However, although there does not appear to a concentrated market based on total semiconductor sales, this does not necessarily indicate that the market for a specific type of semiconductor is not substantially more concentrated.\textsuperscript{75} For example, consider the market for 1 megabyte DRAM chips (1-Mbit chips). In 1988, there were seventeen companies in the market of selling 1-Mbit chips.\textsuperscript{76} The four largest sellers of 1-Mbit chips had a combined market share of 68%, with a breakdown by company as follows: Toshiba, 28%; NEC, 15%; Mitsubishi, 14%; and Hitachi, 11%.\textsuperscript{77} The HHI of this particular market was approximately 1470. Under the 1984 Merger Guidelines, an industry with an HHI index of 1470 is considered to be moderately concentrated.

Assuming that the market breakdown for each separate type of semiconductor more closely follows the market breakdown of the 1-Mbit chip than the market breakdown for overall semiconductor sales, the semiconductor industry would be moderately concentrated. Consequently, this condition, a market concentrated on the selling side, is probably present at least to some degree in some types of chips.

The second condition favorable to collusion exists when there is no fringe of small sellers. In the semiconductor industry, however, a fringe of small sellers appears to exist. In terms of sales of all types of semiconductors, there is certainly a fringe of small sellers, even among the top fifteen companies. Within the top fifteen companies, twelve companies each control less than 10% of the market. In addition, there are more semiconductor companies than just those fifteen. Therefore, in the overall semiconductor industry there is a fringe of small sellers which would make collusion more difficult.

\textsuperscript{74} Id.

\textsuperscript{75} Id.

\textsuperscript{76} Waller, supra note 20, at 25.

\textsuperscript{77} Waller, supra note 20, at 25.

particular product line, it is useful for analyzing firm concentration in the entire semiconductor industry.
Furthermore, even when looking at a particular type of semiconductor, a fringe of small sellers will still probably exist. Consider again the market for 1-Mbit chips. In that situation, the four largest sellers controlled 68% of the market. However, thirteen other sellers were also in the market, each having less than a 10% share of the market; ten of these had less than a 5% market share. With this number of fringe sellers of 1-Mbit memory chips, the possibility of effective collusion by the larger firms should be considerably reduced. If the larger firms attempted to collude to raise prices, one or more of the smaller firms could probably expand production to reduce the increased profits that the larger firms expected to receive from the increased prices. Assuming that the market for each of the other types of semiconductor chips has a similar number of fringe sellers as does the market for 1-Mbit memory chips, then the second condition favorable to collusion is not present within the semiconductor industry.

The third condition favorable to collusion exists when there is inelastic demand at the competitive price. Elasticity of demand is extremely difficult to measure precisely, but some reasonable assumptions can be made relative to the semiconductor industry. The manufacturer's price of a single semiconductor chip is fairly low, for example, a 1-Mbit chip costs approximately $10.00. Prices will vary with the type of chip, but this difference is not significant for the analysis. Semiconductor chips are virtually always sold to companies who intend to incorporate them into a particular product, such as a computer or a television. The semiconductor chip, although it may be the most essential part of the product, is only one part of a product containing potentially hundreds of other components. The price of all of these components together determines what the final selling price of the product will be.

In a situation such as this, the demand for semiconductors is probably quite inelastic. For example, a computer which the manufacturer sells for $2000 may contain semiconductors costing $100. If the sellers of the semiconductors collude to raise prices by 25%, the cost of the semiconductors has now increased to $125 and the selling price of the computer will probably increase to $2050 (assuming a 100% markup over cost). However, the demand for semiconductors would probably not decrease significantly in this situation because the number of purchasers of computers would probably not decrease substantially. Therefore, since under these circumstances a substantial increase in price will probably not significantly affect the demand for semiconductors, the demand for semiconductors tends to be inelastic.

Computers are obviously not the only products which use semiconductors, but most of the products which use semiconductors have the similar characteristic that the semiconductor is only one of a number of
components. As a result, the demand will generally be fairly inelastic. In some situations, the demand may be even more inelastic, such as where a car costing $20,000 uses $100 worth of semiconductors. The converse may also be true, however, where a $500 product may use $100 worth of semiconductors. This analysis assumes that for the majority of products which use semiconductors, the cost of the semiconductors used is relatively low compared to the total cost to produce the product. Consequently, in the majority of situations, the third condition favorable to collusion could reasonably be assumed to be present within the semiconductor industry.

The fourth condition favorable to collusion is entry barriers. One possible entry barrier exists when entry into the market takes a long time. For purposes of analysis, this Note will assume that entry into a new semiconductor market takes a considerable amount of time. A firm must obtain a production site, gain access to the current technology, and acquire, set up, and staff the manufacturing equipment necessary for production. Even if one assumes that a firm desiring to enter the market has the technology to do so efficiently, the amount of time to build or set up a plant to produce semiconductor chips will take a substantial amount of time. For example, the U.S. Memories joint venture anticipated that construction of the plant and preparation to start manufacturing would take at least a full year. The process of manufacturing semiconductor chips is an extremely complicated process and requires a considerable amount of organization before operations may begin.

A delay of one year before entry can occur is a relatively long time. Even if a firm sets up operations in six months, this is a significant period of time. However, it is unclear exactly what effect this length of time would have on the potential for collusion. The colluding firms may decide that the amount of extra profits to be earned during the time before new entry is made may be enormous, and worth the risk that new firms will enter the market to return prices to the competitive level. On the other hand, the amount of additional profits may be only a marginal amount, and the subsequent entry of new competitors may eventually reduce the total amount of profits the colluding firms make in the market. The amount of additional profits which could be earned is dependent upon the elasticity of demand which, as discussed above, is very difficult to measure accurately. Without precise information as to how much additional profits the colluding firms may be able to extract and how long it would take and how many competitors would enter the market, the exact significance of this condition is not clear. Assuming, however, that entry probably will take a considerable amount of time, the semiconductor industry tends to be leaning towards this condition being present.
The fifth condition favorable to collusion is a large number of buyers. This is certainly the situation within the semiconductor industry. Semiconductors are used in a vast number of products, including computers, airplanes, automobiles, televisions, and medical diagnostic equipment. Accordingly, there are a large number of companies which purchase semiconductors. As a result, there are the large number of buyers needed to facilitate the policing of a collusive agreement. As mentioned previously, collusion normally requires firms to be able to monitor the other firms to ensure that they are not cheating. A large shift in the number of buyers from one semiconductor supplier to another creates a strong indication that one of the firms was cheating on the agreement. This condition seems to be present within the semiconductor industry.

The sixth condition favorable to collusion is a standard product. Semiconductors generally are very standardized. For example, while not all 1-Mbit DRAM chips are designed exactly identically, they all function identically. A purchaser can easily substitute one competitor's 1-Mbit chip for that of another competitor. This standardization facilitates collusion since a price can easily be established for the identical products. Thus, condition is also present in the semiconductor industry.

The seventh and last condition favorable to collusion is the situation where price competition is more important than other forms of competition. Price competition is certainly one of the most important types of competition within the semiconductor industry. Each product line is virtually identical, thereby making every supplier's products interchangeable. Quality standards are extremely high, but thorough testing is performed by each manufacturer to ensure that the semiconductor passes the necessary standards. Consequently, the only real form of competition left is on the basis of price. This fact is further demonstrated by the methods that the Japanese have used to gain a substantial share of the United States semiconductor market. The Japanese companies lowered their prices to a level where many United States companies could no longer compete on the basis of price, and since that was the only real form of competition, purchasers of semiconductors switched to buying the lower cost Japanese semiconductors. Price competition is certainly more important than other forms of competition within the semiconductor industry, and therefore the seventh condition favorable to collusion is present.

Having analyzed each of the seven conditions favorable to collusion to determine whether any are present in the semiconductor industry, this author has concluded that most of the conditions are present in the industry. The sole exception is probably the condition that a fringe of small sellers exists. The presence of all these factors obviously does not mean that collusion is taking place within the industry, but they do
tend to indicate that the industry structure has the potential to facilitate collusion. The single exception is probably not of such a tremendous weight that it alone could effectively offset the other conditions which are favorable to collusion. Since new entries into the market may take a considerable amount of time, any substantial expansion by the fringe sellers may also take a considerable period of time. Thus, even when viewed as a whole the semiconductor industry structure is favorable to collusion.

Similarly, the industry structure does not alleviate the risks of loss of potential competition, market exclusion and access discrimination. Any combination of potential competitors will still reduce the number of potential sellers, even though it will add a new actual seller. The semiconductor industry is also an industry where the risk of market exclusion and access discrimination are especially present. For example, a firm’s access to the latest chip making technology is crucial if it intends to compete in that market.

Consequently, the semiconductor industry is not an industry where anticompetitive risks are not present. Since the semiconductor industry has the same basic structure and anticompetitive risks as other industries which are subject to the general antitrust laws, there is no reason based upon the structure of the industry to conclude that the semiconductor industry should be treated differently.

B. EFFICIENCIES

Assuming that there are anticompetitive risks in the semiconductor industry, there could still be other reasons which may justify treating this industry differently. One possible argument for differential treatment is that the potential gains from efficiencies related to a joint venture in the semiconductor industry are likely to be significantly greater than the efficiency gains in other industries. Assuming that the efficiency potential is very significant, this argument may support a presumption that the joint venture is valid. Under this presumption, the efficiency gains could be assumed to outweigh the anticompetitive costs, unless the party challenging the joint venture could show that the costs exceeded the efficiency gains. This presumption would virtually ensure that all joint ventures would be approved.

Under current Rule of Reason analysis, courts have generally avoided considering efficiencies. This is probably due to the difficulty in balancing the amount of the efficiencies against the costs from the anticompetitive effects. However, in two cases, *Yamaha Motor Co. v. FTC (Yamaha-Brunswick)*, and *United States v. Columbia Pictures (Screen*
the courts did consider the efficiencies of the joint ventures in determining whether to allow the joint ventures to occur. However, the courts did not attempt to quantify the efficiencies in any way, but rather somehow weighed the efficiencies against the anticompetitive effects.

The problem with incorporating efficiencies into a Rule of Reason analysis is that efficiencies are exceptionally difficult to quantify and measure. There are a number of efficiency advantages which can be achieved through a joint venture, but present economic analyses do not provide a method of quantifying these efficiencies in most cases. However, a reasonable assumption can be made "that higher levels of integration are likely to be associated with more substantial efficiencies." This assumption provides the basis for the argument that the extent of integration of firms in a joint venture is an indication as to the amount of efficiencies the joint venture will achieve.

The extent of integration of firms in a joint venture is not the only indicator of the efficiency potential of a joint venture. Another reasonable assumption is that the greater the amount of technology required to produce a product, the more likely it is that substantial efficiencies will be achieved. Generally, the greater the amount of technology required to produce a product, the more complicated and costly the production process becomes. Consequently, a joint venture which allows firms to share the costs associated with production and other technology which may improve the manufacturing techniques will likely result in substantial efficiencies.

However, even if the efficiency argument is accepted, it is not clear that the semiconductor industry should be treated entirely differently from other industries. Some form of antitrust laws would have to remain to prevent the large firms from forming joint ventures which, even though they may have great efficiencies, would eventually eliminate their smaller competitors. Therefore, a Rule of Reason analysis would probably still be necessary. The acceptance of this counter-argument could lead courts to be more receptive of efficiency arguments when deciding whether to allow joint ventures in the semiconductor industry. Although this would clearly not be a presumption of legality in favor of joint ventures in the semiconductor industry, it could lead to

80. Pitofsky, supra note 44, at 415-16.
81. Pitofsky, supra note 44, at 415.
82. Pitofsky, supra note 44, at 415.
83. However, depending on what one believes the goals of antitrust to be, this elimination may not be considered to have a negative effect on society as a whole, because only more efficient firms remain.
the result that virtually all joint ventures, except for joint ventures among the very largest of the semiconductor firms, would be valid.

C. JOINT VENTURES MAY FACILITATE THE SPREAD OF TECHNOLOGY

Another argument in favor of treating joint ventures with leniency under the antitrust laws is that joint ventures may facilitate the spread of technology, thereby preserving future competitiveness within the industry. This argument states that the joint venture will give more firms access to the vital technology which is necessary for them to remain competitive. If a firm fails to obtain the technology, or is slower than its competitors in obtaining it, the firm will cease to be competitive with the more advanced firms. Accordingly, this lagging firm will probably eventually either fail or be forced to merge with another firm.

The semiconductor industry is certainly an industry where technology changes rapidly, requiring a firm to maintain state-of-the-art technology in order to remain competitive. The joint venture is one method which allows firms to share this technology and thereby remain competitive.

However, even if one accepts that the joint venture will effectively facilitate the spread of technology, this does not necessarily lead one to the conclusion that this spread of technology will preserve future competition. The preservation of competition will likely depend upon which firms enter joint ventures and spread the technology, and which firms receive the benefit of the spread of technology. If, for example, the two or three largest firms form a joint venture which substantially increases their technological advantage over the smaller competing firms, these larger firms could likely gain even greater market share for themselves. Eventually this could lead to some smaller firms deciding to merge with other firms or leave the market, which would actually reduce the amount of competition.

Therefore, there would still be a need for some form of antitrust laws to decide whether a joint venture would reduce competition or enhance the overall competitiveness of the industry. The current Rule of Reason approach to joint ventures considers this factor when deciding whether to allow a joint venture to occur. Consequently, this argument does not seem to support any notion that the semiconductor industry should be treated differently based upon the need to obtain technology in order to remain competitive.

There are other arguments which have been advanced to justify treating the semiconductor industry differently from other industries. One such argument is the need to provide for our national defense.\textsuperscript{84}

\textsuperscript{84} SEMICONDUCTOR REPORT, supra note 1, at 6.
The other argument, somewhat related, is the desire to maintain a domestic semiconductor industry. However, the validity of these arguments is not based on the idea that the semiconductor industry does not pose the same anticompetitive risks as other industries or does not in some way violate the goals of the antitrust laws. Instead, they are based on the notion that despite any potential anticompetitive effects, the antitrust laws should be changed to achieve these specifically desired goals. Accordingly, since the merits of these arguments will ultimately depend on whether one accepts the validity of the desired goals, this Note will not attempt to determine whether these arguments present valid reasons for allowing differing treatment to the semiconductor industry.

V. CONCLUSION

This Note has not attempted to determine whether the proposals made by the National Advisory Committee should be approved, nor has it attempted to evaluate whether current antitrust laws are appropriate. This Note has been limited to determining whether the semiconductor industry is somehow a unique industry, deserving of preferential treatment under the antitrust laws.

The semiconductor industry does not appear to be sufficiently different from other industries so as to justify granting it preferential treatment under the antitrust laws. The structure of the industry poses the same risks of collusion as other industries, and no other factors appear to be present which would tend to compensate for the anticompetitive risks. Consequently, the semiconductor industry should be subjected to the same antitrust laws as other industries. However, if one could show that the semiconductor industry does have a greater potential for efficiencies than other industries, a change in the Rule of Reason analysis may be justified. Courts could be required to evaluate the potential efficiencies, and make assumptions that there is a strong likelihood that substantial efficiencies will occur. Beyond this possible modification to the Rule of Reason, there does not appear to be any other reasons to treat the semiconductor industry differently.

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85. SEMICONDUCTOR REPORT, supra note 1, at 6-7.

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