

Rose, Nancy L.

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## Program Report

### Industrial Organization

Nancy L. Rose\*

The NBER's Program on Industrial Organization (IO) celebrates its tenth anniversary this year. The program has grown to include 34 members who are engaged in research on a wide range of topics. Rather than attempting an exhaustive review of program activity, this report provides an overview of the most active research areas since the last program report in 1997. These areas include e-commerce, restructured electricity markets, firm behavior in oligopoly markets, and the organization of firms and vertical relationships. Reviews of the substantial body of research on technology and technical change are deferred to reports of the NBER's Program on Productivity and Technological Change and the NBER's Working Group on Industrial Technology and Productivity. The NBER website <http://www.nber.org/programs/io/io.html> contains links to the full body of research done under the auspices of this and other NBER research programs.

### E-Commerce Initiative

The NBER sponsored a yearlong research project on the organizational and competitive implications of e-commerce. The results of that project, which was organized by Garth Saloner and Severin Borenstein, were discussed at a two-day meeting in January 2001. The following month, key findings were showcased at an industry/academic conference held at Stanford University. This project focused on three themes: the impact of electronically mediated commerce on vertical relationships between firms; the effect of e-commerce on pricing behavior; and Internet auction performance. Later this year, the

*\*Rose is Director of the NBER's Program on Industrial Organization and a professor of economics at MIT.*

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## ***The Importance of Market Institutions***

The detailed rules used to establish and operate the wholesale power market can have significant effects on the exercise of market power. Catherine D. Wolfram's work on strategic bidding in England and Wales focuses on incentives provided by the multi-unit nature of the auction.<sup>19</sup> The study by Wolak and Robert H. Patrick of the market in England and Wales suggests that the major generators exploit these rules in their strategic choices of capacity availability to enhance their profits.<sup>20</sup> Long-term contracting between generators and electricity buyers may mitigate the incentives to exploit market power. But the use of long-term supply or hedge contracts varies considerably across markets. California's restructuring specifically prohibited distribution companies from signing long-term supply contracts with most generators, while Australia's National Electricity Market required vesting contracts between generators and distributors. Wolak's work on the Australian market suggests that hedging contracts may have played a significant role in maintaining wholesale prices close to marginal costs after the restructuring in Australia.<sup>21</sup> Work by Patrick and Wolak on retail-customer response to real-time market prices for electricity explores another institution for mitigating market power—the introduction of demand-side sensitivity to market price.<sup>22</sup>

## **Firm Behavior in Oligopoly Markets**

The behavior of firms in oligopoly markets is one of the mainstays of IO research. One important strand of this research focuses on the mechanisms through which firms exercise potential market power. Genesove and Wallace P. Mullin have continued their historical research into collusive


behavior in environments that are subject to minimal antitrust scrutiny. They show how communication and price transparency enable firms to sustain collusive outcomes, even in the absence of explicit agreement on prices and output levels.<sup>23</sup> Aviv Nevo's analysis of the breakfast cereal market suggests that product differentiation and brand location may significantly improve firms' abilities to raise prices in this market, whether or not they engage in cooperative pricing behavior.<sup>24</sup> Steven T. Berry and Joel Waldfogel find evidence of similar spatial preemption in their analysis of mergers in the radio broadcasting industry.<sup>25</sup> In his analysis of Chrysler's introduction of the minivan, Amil Petrin finds that locational rents accruing to new product introductions also may be associated with substantial consumer benefits.<sup>26</sup>

The role of firms' promotional activities in oligopoly markets has attracted renewed empirical interest. For example, Nevo and Wolfram show that manufacturers' promotional coupons and retailers' price discounts are complements, rather than substitutes, in the breakfast cereal market. This contradicts simple models of couponing as a form of price discrimination.<sup>27</sup> The authors suggest that the patterns they observe are consistent with more complex models of oligopoly price discrimination, or managerial responses to sales or market share targets. To explore the interaction of advertising and price choices at the retail level, Jeffrey Milyo and Waldfogel use a natural experiment created by a Rhode Island court decision that struck down the state's ban on advertising liquor prices.<sup>28</sup> They find that although stores that advertise particular products tend to reduce the prices of those products, the prices of products that are not advertised and the prices at stores that don't advertise both tend to increase. In their analysis of supermarket pricing behavior and price margins, Chevalier, Anil K

Kashyap, and Peter E. Rossi find support for similar loss-leader models of retail pricing and advertising competition.<sup>29</sup>


Antitrust policy may be better informed by a clearer understanding of which actions are likely to enhance the operation of a market via cost reductions or product enhancements and which are likely to improve profitability at the expense of overall economic surplus, by enabling firms to exercise market power more effectively. Most analyses of mergers and strategic alliances consider tradeoffs between concerns about efficiency versus market power. Martin Pesendorfer estimates significant cost efficiencies from mergers in the paper industry, and argues that these may offset price increases, thus raising overall welfare.<sup>30</sup> Gustavo E. Bamberger, Carlton, and Lynette R. Neumann's analysis of domestic-airline alliances uncovers potential benefits for both firms and consumers through improved service and reduced costs.<sup>31</sup> However, Shane Greenstein and his co-authors argue that analyses of market power may be quite sensitive to the method used to define local markets. Their research on hospital mergers suggests that, contrary to certain assumptions about many mergers in this industry, the existence of some consumers who are willing or able to travel to distant hospitals may provide little post-merger price discipline on local hospitals.<sup>32</sup>

Recent work emphasizes how important it is to model firm interactions and industry equilibrium in dynamic contexts. Ariel Pakes has been in the forefront of this research initiative. His provocative theoretical work with Chaim Fershtman suggests that once the dynamic structure of industries is considered, many of our working assumptions about the benefits of collusion may be misleading. In their model of dynamic oligopoly, price collusion among firms leads to



increases in product variety and quality that are sufficient to generate net benefits for consumers despite higher prices.<sup>33</sup> In part because of substantial modeling complexities, empirical implementation of dynamic models of industries remains relatively uncommon. Pakes, in an effort to broaden the use of these methodologies, has developed a framework to guide empirical researchers interested in modeling the dynamic evolution of industries.<sup>34</sup> Recent work by C. Lanier Benkard on the development of the commercial aircraft industry illustrates the potential of these approaches.<sup>35</sup> In their work, David S. Evans and Richard Schmalensee discuss the implications of industry dynamics for antitrust policies.<sup>36</sup>

## Internal Organization and Vertical Relationships among Firms



Economists are increasingly interested in studying the determinants and implications of firms' boundaries, the organization of activities within those boundaries, and the relationships across them. One important strand of research analyzes firms' objectives. Although traditional neo-classical models assume profit maximization, economists have been interested for some time in the empirical validity of this assumption, particularly across alternative market and governance structures. Randall S. Kroszner and Philip E. Strahan explore the determinants and implications of alternative governance structures, focusing on conflicting objectives that may emerge when commercial bankers serve on the boards of nonfinancial firms.<sup>37</sup> Chevalier and Glenn Ellison examine the organization of the mutual fund industry and the response of managers in this sector to implicit and explicit incentives. The researchers document systematic changes in

managerial behavior over a career cycle and explore the implications of those changes for fund performance.<sup>38</sup> Borenstein and Joseph Farrell demonstrate that managers may minimize costs when economic pressures are intense, but in profitable periods, they will take advantage of financial slack to ease such constraints.<sup>39</sup> Scott Morton and Joel Podolny, in their analysis of the California wine industry, discuss how the existence of firms that do not maximize profits may affect the operation of profit-maximizing firms and of the overall market.<sup>40</sup>

Thomas N. Hubbard has used data on the trucking industry to explore the organization of trucking firms and shippers' decisions to purchase or provide their own transportation. He studies the development of onboard computer technologies that enhance the ability of trucking firm managers to monitor and communicate with their drivers. Hubbard investigates the determinants of diffusion for this technology and studies its implications for the choice between company drivers and owner-operators. Hubbard and George B. Baker argue that the development and introduction of onboard computers has had profound effects on the organization of and relationships among firms in this market.<sup>41</sup> Hubbard finds that market "thickness," measured as the density of potential trading partners for a given type of transaction, is an important determinant of this industry's contractual relationships.

Make-or-buy decisions that affect the vertical scope of activities within and between firms continue to attract enormous interest from economists.<sup>42</sup> In the retail sector, many make-or-buy decisions take the form of whether to operate company-owned or franchised outlets. Asher Blass and Carlton discuss the determinants of this choice in the retail gasoline sector, arguing that "divorcement" laws, which prohibit refiners from operating their own

service stations, lead to higher retail gasoline prices.<sup>43</sup> Francine Lafontaine's long-term project on franchising has yielded a number of important insights about this practice. Her recent work with Margaret E. Slade documents a set of robust empirical regularities in the franchising literature and illustrates the inability of standard theoretical models to fully explain these facts.<sup>44</sup> One surprise is the high degree of contract uniformity among franchise outlets that operate under very different conditions. Lafontaine and Joanne Oxley show that this uniformity extends across national boundaries: U.S. and Canadian firms extend franchise operations into Mexico, setting the same conditions and terms that apply in their home markets.<sup>45</sup> Scott Morton and Zettelmeyer look at what might be termed make-and-buy decisions: what determines whether supermarkets will carry a store brand as well as national versions of a product.<sup>46</sup> Their theoretical model of supermarket-and-manufacturer bargaining over supply terms demonstrates the potential for a supermarket's strategic introduction of store brands to improve its bargaining position. Scott Morton and Zettelmeyer's empirical test, which uses data on private-label brands across product categories and supermarkets, provides support for this explanation of store-branding decisions.

Relationships among firms in a vertical supply chain raise a number of questions for antitrust policymakers. It can be difficult to determine which contractual restrictions between firms facilitate efficient transactions and which are used to exercise or extend market power, but making the wrong choice may substantially impede the operation of a market. NBER researchers have been studying trade-offs between efficiency and market power and assessing the relative strengths of each in various contexts. Recent work has looked at exclusionary contracts (which bar certain

firms from buying products, usually for resale), tying contracts (which link the sales of two of a firm's products), and collective determination of credit card system interchange fees.<sup>47</sup> This area of research addresses issues that have arisen in controversial antitrust proceedings in several technology-intensive network industries. Understanding the effects of vertical restraints, their operation in network sectors, and their implications for both competition and individual competitors is critical to constructing appropriate policy responses.

## Summary

This report presents an overview of four of the major research areas in the NBER's IO Program over the past four years. A wealth of IO working papers outside these areas may be viewed at the NBER web site at <http://papers.nber.org/papersbyprog/IO.html>. Coincidentally, work by Ellison documents a dramatic slowdown in the publication process of leading economics journals. He tests a variety of possible explanations for this phenomenon, preferring the one based on development of social norms that are intensifying the review process.<sup>48</sup> Given such widespread delays, the NBER's Working Paper series will continue to be an invaluable source of information on recent research in IO.

<sup>1</sup> NBER researchers also have studied the development of the Internet, independent of e-commerce. See, for example, S. Greenstein, "Building and Delivering the Virtual World: Commercializing Services for Internet Access," NBER Working Paper No. 7690, May 2000; and D. Elfenbein and J. Lerner, "Links and Hyperlinks: An Empirical Analysis of Internet Portal Alliances, 1995-1999," NBER Working Paper No. 8251, April 2001.

<sup>2</sup> L. Garicano and S. N. Kaplan, "The Effects of Business-to-Business E-Commerce on Transaction Costs," NBER Working Paper No. 8017, November 1990.

<sup>3</sup> R. H. Gertner and R. Stillman, "Vertical Integration and Internet Strategies in the Apparel Industry" (paper presented at E-

Commerce Project Academic/Industry Conference, Stanford, Calif., February 2001).

<sup>4</sup> D. W. Carlton and J. A. Chevalier, "Free Riding and Sales Strategies for the Internet," NBER Working Paper No. 8067, January 2001.

<sup>5</sup> A. Goolsbee, "Competition in the Computer Industry: Online versus Retail" (paper presented at E-Commerce Conference, Bodega Bay, Calif., January 2001).

<sup>6</sup> F. M. Scott Morton, F. Zettelmeyer, and J. S. Risso, "Internet Car Retailing," NBER Working Paper No. 7961, October 2000.

<sup>7</sup> J. R. Brown and A. Goolsbee, "Does the Internet Make Markets More Competitive?" NBER Working Paper No. 7996, November 2000.

<sup>8</sup> K. Clay, R. Krishnan, and E. Wolff, "Prices and Price Dispersion on the Web: Evidence from the Online Book Industry," NBER Working Paper No. 8271, May 2001.

<sup>9</sup> M. D. Smith and E. Brynjolfsson, "Consumer Choice Behavior at an Internet Shopbot" (paper presented at E-Commerce Conference, Bodega Bay, Calif., January 2001).

<sup>10</sup> K. Hendricks, J. Pinske, and R. H. Porter, "Empirical Implications of Equilibrium Bidding in First-Price, Symmetric, Common-Value Auctions," NBER Working Paper No. 8294, May 2001; E. M. R. A. Engel, R. D. Fischer, and A. Galetovic, "How to Auction an Essential Facility When Underhand Integration Is Possible," NBER Working Paper No. 8146, March 2001; and S. Athey and J. Levin, "Information and Competition in U.S. Forest Service Timber Auctions," NBER Working Paper No. 7185, June 1999.

<sup>11</sup> P. Resnick and R. Zeckhauser, "Trust among Strangers in Internet Transactions: Empirical Analysis of eBay's Reputation System" (paper presented at E-Commerce Conference, Bodega Bay, Calif., January 2001).

<sup>12</sup> A. E. Roth and A. Ockenfels, "Last Minute Bidding and the Rules for Ending Second-Price Auctions: Theory and Evidence from a Natural Experiment on the Internet," NBER Working Paper No. 7729, June 2000.

<sup>13</sup> R. Katkar and D. Lucking-Reiley, "Public versus Secret Reserve Prices in eBay Auctions: Results from a Pokemon Field Experiment," NBER Working Paper No. 8183, March 2001.

<sup>14</sup> S. Borenstein, J. Bushnell, and S. Stoff, "The Competitive Effects of Transmission Capacity in a Deregulated Electricity Industry," NBER Working Paper No. 6293, November 1997.

<sup>15</sup> F. A. Wolak, "Identification and

Estimation of Cost Functions Using Observed Bid Data: An Application to Electricity Markets," NBER Working Paper No. 8191, March 2001.

<sup>16</sup> S. Borenstein and J. Bushnell, "An Empirical Analysis of the Potential for Market Power in California's Electricity Industry," NBER Working Paper No. 6463, March 1998, and *The Journal of Industrial Economics*, 47 (September 1999).

<sup>17</sup> S. Borenstein, J. Bushnell, and F. A. Wolak, "Diagnosing Market Power in California's Restructured Wholesale Electricity Market," NBER Working Paper No. 7868, September 2000.

<sup>18</sup> P. Joskow and E. Kahn, "A Quantitative Analysis of Pricing Behavior in California's Wholesale Electricity Market during Summer 2000," NBER Working Paper No. 8157, March 2001.

<sup>19</sup> C. D. Wolfram, "Strategic Bidding in a Multi-Unit Auction: An Empirical Analysis of Bids to Supply Electricity," NBER Working Paper No. 6269, November 1999, and *RAND Journal of Economics*, 29 (Winter 1998), pp. 703-25.

<sup>20</sup> F. A. Wolak and R. H. Patrick, "The Impact of Market Rules and Market Structure on the Price Determination Process in the England and Wales Electricity Market," NBER Working Paper No. 8248, April 2001.

<sup>21</sup> F. A. Wolak, "An Empirical Analysis of the Impact of Hedge Contracts on Bidding Behavior," NBER Working Paper No. 8212, April 2001.

<sup>22</sup> R. H. Patrick and F. A. Wolak, "Estimating the Customer-Level Demand for Electricity Under Real-Time Market Prices," NBER Working Paper No. 8213, April 2001.


<sup>23</sup> D. Genesove and W. P. Mullin, "Rules, Communication, and Collusion: Narrative Evidence from the Sugar Institute Case," NBER Working Paper No. 8145, March 2001.

<sup>24</sup> A. Nevo, "Measuring Market Power in the Ready-to-Eat Cereal Industry," NBER Working Paper No. 6387, January 1998.

<sup>25</sup> S. T. Berry and J. Waldfogel, "Mergers, Station Entry, and Programming Variety in Radio Broadcasting," NBER Working Paper No. 7080, April 1999; and S. T. Berry and J. Waldfogel, "Public Radio in the United States: Does It Correct Market Failure or Cannibalize Commercial Stations?" NBER Working Paper No. 6057, June 1997.

<sup>26</sup> A. Petrin, "Quantifying the Benefits of New Products: The Case of the Minivan," NBER Working Paper No. 8227, April 2001.

<sup>27</sup> A. Nevo and C. Wolfram, "Prices and



Coupons for Breakfast Cereals," NBER Working Paper No. 6932, February 1999.

<sup>28</sup> J. Milyo and J. Waldfogel, "The Effect of Price Advertising and Prices: Evidence in the Wake of 44 Liquormart," NBER Working Paper No. 6488, March 1998.

<sup>29</sup> J. A. Chevalier, A. K. Kashyap, and P. E. Rossi, "Why Don't Prices Rise During Periods of Peak Demand? Evidence from Scanner Data," NBER Working Paper No. 7981, October 2000.

<sup>30</sup> M. Pesendorfer, "Horizontal Mergers in the Paper Industry," NBER Working Paper No. 6751, October 1998.

<sup>31</sup> G. E. Bamberger, D. W. Carlton, and L. R. Neumann, "An Empirical Investigation of the Competitive Effects of Domestic Airline Alliances," NBER Working Paper No. 8197, March 2001.

<sup>32</sup> C. S. Capps, D. Dranove, S. Greenstein, and M. Satterwaite, "The Silent Majority Fallacy of the Elzinga-Hogarty Criteria: A Critique and New Approach to Analyzing Hospital Mergers," NBER Working Paper No. 8216, April 2001.

<sup>33</sup> C. Fershtman and A. Pakes, "A Dynamic Oligopoly with Collusion and Price Wars," NBER Working Paper No. 6936, February 1999.

<sup>34</sup> A. Pakes, "A Framework for Applied Dynamic Analysis in IO," NBER Working Paper No. 8024, December 2000.

<sup>35</sup> C. L. Benkard, "A Dynamic Analysis of the Market for Wide-Bodied Commercial Aircraft," NBER Working Paper No. 7710, May 2000.

<sup>36</sup> D. S. Evans and R. Schmalensee, "Some Economic Aspects of Antitrust Analysis in Dynamically Competitive Industries,"

NBER Working Paper No. 8268, May 2001.

<sup>37</sup> R. S. Kroszner and P. E. Straban, "Bankers on Boards: Monitoring, Conflicts of Interest, and Lender Liability," NBER Working Paper No. 7319, August 1999.

<sup>38</sup> J. A. Chevalier and G. Ellison, "Career Concerns of Mutual Fund Managers," NBER Working Paper No. 6394, February 1998, and *Quarterly Journal of Economics*, 114 (May 1999).

<sup>39</sup> S. Borenstein and J. Farrell, "Do Investors Forecast Fat Firms? Evidence from the Gold Mining Industry," NBER Working Paper No. 7075, April 1999.

<sup>40</sup> F. M. Scott Morton and J. M. Podolny, "Love or Money? The Effects of Owner Motivation in the California Wine Industry," NBER Working Paper No. 6743, October 1998.

<sup>41</sup> T. N. Hubbard, "How Wide Is the Scope of Hold-Up-Based Theories? Contractual Form and Market Thickness in Trucking," NBER Working Paper No. 7347, September 1999; T. N. Hubbard, "Why are Process Monitoring Technologies Valuable? The Use of On-Board Information Technology in the Trucking Industry," NBER Working Paper No. 6482, March 1998; and G. P. Baker and T. N. Hubbard, "Contractibility and Asset Ownership: On-Board Computers and Governance in U.S. Trucking," NBER Working Paper No. 7634, April 2000.

<sup>42</sup> G. M. Grossman and E. Helpman, "Incomplete Contracts and Industrial Organization," NBER Working Paper No. 7303, August 1999.

<sup>43</sup> A. Blass and D. W. Carlton, "The Choice

of Organizational Form in Gasoline Retailing and the Costs of Laws Limiting Choice," NBER Working Paper No. 7435, December 1999.

<sup>44</sup> F. Lafontaine and M. E. Slade, "Incentive Contracting and the Franchise Decision," NBER Working Paper No. 6544, May 1998.

<sup>45</sup> F. Lafontaine and J. Oxley, "International Franchising: Evidence from U.S. and Canadian Franchisors in Mexico," NBER Working Paper No. 8179, March 2001.

<sup>46</sup> F. M. Scott Morton and F. Zettelmeyer, "The Strategic Positioning of Store Brands in Retailer-Manufacturer Bargaining," NBER Working Paper No. 7712, May 2000.

<sup>47</sup> D. W. Carlton, "A General Analysis of Exclusionary Conduct and Refusal to Deal — Why Aspen and Kodak are Misguided," NBER Working Paper No. 8105, February 2001; D. W. Carlton and M. Waldman, "Competition, Monopoly, and Aftermarkets," NBER Working Paper No. 8086, January 2001; D. W. Carlton and M. Waldman, "The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries," NBER Working Paper No. 6831, December 1998; and R. Schmalensee, "Payment Systems and Interchange Fees," NBER Working Paper No. 8256, April 2001.

<sup>48</sup> G. Ellison, "The Slowdown of the Economics Publishing Process," NBER Working Paper No. 7804, July 2000; and G. Ellison, "Evolving Standards for Academic Publishing: A q-r Theory," NBER Working Paper No. 7805, July 2000.

