Buyer Countervailing Power:
A Survey of the Theory and Experimental Evidence

Bradley J. Ruffle

Ben-Gurion University

December 2005

Abstract:

The rise of mega-retailers and industry concentration levels has recently generated an interest among economists and antitrust policymakers in the effects of buyer countervailing power. There exists a considerable theoretical literature offering a range of sources of powerful buyers' ability to extract price discounts. The explanations that have been tested experimentally have all found laboratory support. This paper surveys the theoretical literature on countervailing power, emphasizing experimental tests where available. The increasing policy relevance of this topic and the blossoming of theoretical models contrasted with the dearth of experimental tests point to fruitful directions for research.

Contact Information: Department of Economics, Ben-Gurion University, Beer Sheva, Israel, 84105 , P.O.B. 653, Beer Sheva, 84105, Israel, tel: +972-8-6472308, fax: (917) 591-8151, e-mail: `bradley@bgu.ac.il`

1 Introduction

The industrial organization literature has traditionally focused exclusively on seller strategies. Buyers are typically assumed to act as passive price-takers, accepting all sellers' prices below their demand curves. While this assumption may accurately describe the individual consumer's purchasing decision, non-retail sales account for one-third of the gross domestic product. In industrial-product, wholesale and intermediate-product markets, a small number of sellers typically compete with one another for the business of a small number of large buyers. In such settings, there is no theoretical or even intuitive reason to believe that buyers should be any less influential in establishing the price than sellers.

Galbraith (1952) first introduced the notion of buyer countervailing power. Galbraith contended that powerful buyers constitute an active restraint to monopoly power. Galbraith claimed not only that such strong buyers were ubiquitous, existing in virtually every non-retail industry, but that free enterprise ensured their existence: wherever an industry had become too concentrated, economic incentives gave rise to powerful buyers to offset the trend toward seller concentration.

Galbraith's idea was initially criticized on numerous grounds. Stigler (1954) expected "bilateral oligopoly to be relatively monopolistic in operation . . . it simply is romantic to believe that a competitive solution will emerge, not merely in a few peculiar cases, but in the general run of industries where two small groups of firms deal with one another suddenly all the long-run advantages of monopolistic behavior have been lost sight of in a welter of irrational competitive moves." (p. 9) Prior to the advent of mega-retailers, Hunter (1958) found no evidence in Britain for the rise of large-scale retailers in response to an observed increase in the concentration of production of numerous consumer goods.

Competition authorities' recognition of the importance of powerful buyers long precedes Galbraith's. Section 2 of the 1914 Clayton Act prohibits price discrimination between different purchasers on all goods and services, but explicitly exempts quantity discounts. As a result of this loophole, the Federal Trade Commission succeeded in ob-

taining cease-and-desist orders in only eight of 43 cases of price discrimination initiated between 1914 and 1936.[1] The rise of mass retailers in the 1930s like A&P, Sears, Roebuck & Co. and Woolworth's led their smaller competitors and their suppliers to pressure legislators to prohibit preferential pricing for selected buyers. These lobbying efforts produced the Robinson-Patman Act in 1936, an amendment to Section 2 of the Clayton Act. Thanks to this new legislation, the Federal Trade Commission succeeded in prosecuting and obtaining cease-and-desist orders in more than one thousand cases of third-degree price discrimination from 1936 to 1972.

In contrast to the aggressive legislative approach in the U.S., European countries have historically chosen to treat buyer power on a case-by-case basis. Despite observed increases in buyer concentration in Europe, particularly in the retail sector,[2] Dobson and Waterson (1997) argue that "U.K. competition authorities have remained largely impassive" (p. 418), choosing instead to take a "benign view of consolidation in retailing ... in contrast to the position adopted in the United States ... [Consequently,] U.S. concentration levels in retailing have generally risen at a much slower pace than in the United Kingdom" (p. 419). Dobson and Waterson further note that the U.K. Competition Commission has taken action to block only one proposed merger in recent years (p. 428). Similarly, the Netherlands Competition Authority (NMa) concluded abuse of a dominant position in only two cases in 2003, despite receiving 159 complaints of abuse, 79 of which were immediately dismissed. One of the cases of declared abuse concluded with the NMa fining CR Delta, the Netherlands largest supplier of bull semen to cattle farmers, for employing three distinct discount schemes that could not be justified on the basis of cost savings and served to bind cattle farmers to its product and limit access to competing suppliers.[3] One is left to speculate whether similar supplier discount schemes would have

---

[1]Scherer and Ross (1990, pp. 508-516) and the references therein provide a fuller discussion of the history of antitrust policies toward price discrimination.

[2]See, for example, the European Commission's (1999) case studies of buyer power and its impact on national competition in food retailing.

[3]van Damme, Hancher, Larouche and Muller (forthcoming) discuss the specifics of CR Delta's quantity discount and customer loyalty schemes. Additional details concerning the legal aspects of the case can be found in the NMa's January 7, 2004 press release, available on its website at:

been successfully prosecuted had the buyers been large.

U.S. competition authorities also appear to have adopted a less antagonistic view of buyer power in recent years. In 1982 the U.S. Horizontal Merger Guidelines were revised to cite the "ability of sophisticated buyers to devise long-term contracts to break collusive agreements" as a measure to evaluate the competitiveness of an industry. The 1997 revision to the Horizontal Merger Guidelines and the U.K.'s 1998 Competition Act both recognize efficiency gains and the possibility that they will be partially passed on to consumers as a defense for mergers among buyers. In practice, however, antitrust authorities lack clear guidelines regarding, for instance, buyer size or concentration levels sufficient to counteract powerful sellers.

The absence of clear empirically established criteria for evaluating countervailing power may explain what may be interpreted as the U.S. courts' reluctance to approve mergers despite a seemingly concentrated buyer side of the market. For instance, in United States v. Country Lake Foods, Inc. (1990), the merger between two fluid milk processors was blocked, despite the court's recognition that three large customers who accounted for over 90% of all purchases had the ability to monitor milk prices, switch suppliers and to enter the milk processing market themselves. More recently, America's first and second largest pharmaceutical companies concurrently proposed to merge with the fourth and third largest firms, respectively. The justification put forth for these multi-billion dollar mergers was the claim that 80% of the estimated \$306.9 million in fixed cost savings due to the elimination of redundancies would be passed onto large pharmaceutical buyers, mainly hospitals, purchasing blocs that represent groups of hospitals and retail chains like WalMart, in the form of lower prices. Again, the absence of guidelines for assessing large buyers' countervailing role and the Surpreme Court's ruling on Section 7 of the Clayton Act that "possible economies cannot be used as a defense to illegality" in merger cases led the courts block both mergers (United States District Court for the District of Columbia 1998, p. 41).

———————————————————————

$http://www.nmanet.nl/en/.$

This paper surveys the experimental work on the role of buyers in markets. While experimental methods are not well suited to examine the dynamic evolution of industry structure inherent in Galbraith's countervailing power thesis, they are ideal for testing the static factors of buyer structure (e.g. buyer concentration and size) hypothesized to counteract seller market power.

The remainder of this paper organizes the countervailing role of buyers according to source. Section 2 explores the ability of retail consumers motivated by fairness considerations to constrain seller market power. Section 3 examines a number of sources of buyer market power relevant for non-retail markets that fall within the categories of buyer concentration and buyer size. Section 4 concludes.

2   Non-Passive Buyers and Fairness in Retail Markets

The starting point for this literature is the observation that individuals are not motivated solely by monetary considerations, but also by equity and fairness concerns. Kahneman, Knetsch and Thaler (1986) survey the perceived fairness associated with unconstrained profit-maximization by firms. Price increases that follow from excess demand (e.g., on snow shovels in a snowstorm) rather than cost increases are deemed unfair by the vast majority of respondents. The authors conclude from these perceptions that markets will fail to clear in the short run as consumers respond to what they see as unjustified price increases by foregoing purchases. A more skeptical interpretation is that sellers will always attempt justify price increases by claiming cost increases.

Kachelmeier, Limberg and Schadewald (1991a) test whether these survey responses are robust to real economic incentives in market experiments. The five sellers and five buyers in their double-auction markets first participate in ten rounds in which a known 50% income tax is paid by the sellers only. Beginning in round 11, the income tax is replaced with a 20% sales tax that, relative to the first ten rounds, has the effect of increasing the equilibrium price and the fraction of the profits earned by the sellers. The authors compare the convergence properties in three information-disclosure treatments. Their

results reveal modest support for the hypothesis that prices converge quickest to the new, higher-priced equilibrium when supported by known cost increases (the marginal costs of sellers are revealed), whereas the revelation of sellers' profits only impedes convergence relative to the no-disclosure treatment.

Kachelmeier, Limberg and Schadewald (1991b) follow the first seven rounds of play in a double-auction market with a 50-percent profit tax on the sellers in rounds 8-20. Because sellers' marginal units trade at a profit of zero in their design, the profit tax does not affect the competitive-equilibrium price, but merely decreases the sellers' relative share of the available surplus. Nonetheless, their results show that when buyers are informed of the profit tax, prices are higher than when buyers are uninformed of the tax. Moreover, prices in these tax treatments exceed the pre-tax periods; although these differences shrink over time, indicating fairness considerations give way to competitive forces.

Franciosi, Kujal, Michelitsch, Smith and Deng (1995) extend Kachelmeier et al.'s (1991a) design to a posted-offer market, claiming that this is the market institution Kahneman et al. (1986) have in mind in their consumer market examples. Consistent with Kachelmeier et al. (1991a), prices in the profit-disclosure (fairness) treatment are initially below those in the cost- and no-disclosure treatments. However, over time prices in all treatments converge to the competitive equilibrium, again implying that competitive forces trump fairness.

Ruffle (2000) creates more extreme earnings inequalities at the competitive equilibrium in an attempt to determine whether posted-offer market buyers are able to resist convergence to the Nash equilibrium or even the competitive price. Indeed, when the surplus inequality at the competitive equilibrium yields each of the duopoly sellers six times as much as each of the two buyers, buyers withhold demand intensely and succeed in maintaining prices significantly below competitive levels. Interestingly, profit disclosure, rather than provoking increased demand withholding, actually facilitates collusion by allowing sellers to post similar prices and extract more gains from trade.

Tyran and Engelmann (2005) design posted-offer markets with a known cost increase

announced in round 16 of 30. The supply and demand parameters are such that in equilibrium the entire cost increase is passed on to consumers. In their baseline treatment, each of the five buyers individually decides how many of its five units of demand to purchase and withhold, while in their boycott treatment, at the beginning of each period buyers vote whether to boycott the market. A majority vote in favor of a boycott shuts down the market for that period and each market participant earns zero.[4] Otherwise, the period proceeds as in the baseline treatment, with each buyer choosing to purchase or withhold demand. Despite boycotts in 2.7 out of 15 post-cost-increase periods on average, Tyran and Engelmann find that neither boycotts nor individual attempts at withholding are able to prevent convergence to the competitive price.

Perhaps the general ineffectiveness of consumer boycotts at lowering prices explains why they are so infrequently used. Monroe's (1985) study of 90 consumer boycotts in the U.S. between 1970 and 1980 reveals that perceived violations of worker rights and insensitivity to the concerns of various minority groups, rather than exploitative pricing practices, sparked the vast majority of these boycotts.

3 Buyer Countervailing Power in Non-Retail Markets

Galbraith's countervailing buyer thesis was intended for wholesale and intermediate product markets. The theoretical industrial organization literature cites a number of reasons for buyer power relevant for such markets. The emerging experimental literature on this topic has tested and found support for some of these reasons; the remainder await testing. Before discussing the theoretical models and the empirical and experimental evidence of buyer countervailing power, I briefly retrace some of the earlier market experiments that, instead of conducting all experimental sessions with simulated, passive price-taking

---

[4]Kritikos and Bolle's (2004) theoretical model allows the number of consumers and the utility from rejecting the monopolist's offer to vary to derive the likelihood of a consumer boycott.

buyers, also included one or more sessions with human buyers for the sake of comparison.

The workhorse in all of the earlier experiments discussed below is the posted-offer market institution, according to which each seller simultaneously posts a sales price. After all prices are displayed to all buyers and sellers, the buyers proceed in a randomly determined order to purchase the quantity that each desires. Because buyers are unable to make counteroffers or negotiate a better price, their only recourse involves rejecting a profitable purchase, also referred to as demand withholding. In a repeated posted-offer game, a buyer may withhold demand out of fairness concerns (e.g., the seller's proposed split is "unfair") or strategic reasons (e.g., to induce the seller to lower its price next period). In all of these earlier experiments, the induced cost and valuation parameters are strictly private information, thereby eliminating fairness as an explanation of buyer withholding.

3.1   Early Market Experiments

Until recently, market experiments focused almost exclusively on the behavior of sellers. Like the theory the experiments are designed to test, buyers are assumed to act as passive price-takers. Thus, human buyers are replaced by a computer algorithm that continues to purchase from the lowest-priced seller as long as the price is less than (or equal to) the buyer's valuation. In fact, this censorship of human buyers dates back to the earliest oligopoly experiments (Fouraker and Siegel 1963, Friedman 1967). Simulated buyers offer the advantage of reduced subject payments. More importantly, (the threat of) strategic buyer behavior can only confound the interpretation of the data when the research question of interest focuses on the sellers.

Studies with one or more sessions with human buyers include Smith (1981) who conducts a single session with a posted-offer, increasing-cost monopolist facing five human buyers, each with only one unit of demand. In his 11-round experiment, not a single instance of withholding is observed and prices converge in period 5 to the monopoly price.

Coursey, Isaac and Smith (1984) and Brown-Kruse (1991) test the contestable markets hypothesis with a decreasing-cost monopolist facing either computer-simulated or five human buyers. The decreasing-cost schedule implies that demand withholding hits the monopolist's most profitable units first. Both studies find that prices approach or even converge to competitive levels. Moreover, while prices are lower in sessions with instances of demand withholding, the mere presence of human buyers is sufficient to bring about lower prices compared to sessions with simulated ones.

Cason and Williams (1990) test whether extreme earnings inequalities inhibit equilibrium convergence: in their two box-design treatments, one side or the other of the market earns the entire surplus at the competitive price. They conduct one posted-offer session with four human buyers. With only three instances of demand withholding over ten rounds and excess demand at the competitive equilibrium (implying subsequent buyers who do not withhold negate earlier attempts), prices are found to be similar to the other four posted-offer markets with simulated buyers.

Davis and Williams (1990) examine the conjecture that in posted-offer markets the power of the non-posting side is eliminated. To do so, they conduct four posted-offer experiments in which two of the five buyers are endowed with market power in the sense that by withholding two marginally profitable units, the market-clearing price on the remaining units decreases by $0.25. Notwithstanding, two or more profitable units are left unpurchased in only 3 of 65 periods, and even the purchase of marginally profitable units is foregone in a mere 10 of 521 instances. Furthermore, the mean contract price never deviates from the competitive equilibrium by more than $0.10 and prices converge to the competitive equilibrium within 15 periods.

Davis and Williams (1991) test whether seller market power might inhibit convergence to the competitive equilibrium in posted-offer experiments. They compare the results of four simulated-buyer with four human-buyer experiments. Prices exceed the competitive equilibrium by at least $0.30 after three periods in each of the simulated-buyer experiments, while only one human-buyer experiment yields sustained price deviations from the competitive price. They conclude that "...computer-simulated buyers may generate

qualitatively different results than similar posted-offer markets using human buyers, even if human buyers fully reveal demand. Posted-offer sellers appear initially to employ more tentative strategies when facing human buyers than when facing simulated buyers. This conjecture bears further analysis." (p. 273)

In a recent paper, Davis and Wilson (2004) depart from earlier private-information posted-offer experiments by making the supply and demand curves common knowledge. They compare the impact of simulated buyers with that of two human buyers on the pricing of pre- and post-merger sellers that vary according the presence and kind of post-merger synergy. After 25 rounds of play, four sellers are merged into two where the merged sellers benefit from either reduced combined fixed or variable costs or no cost synergies at all. The authors find that human buyers obtain lower prices than simulated ones, both pre- and post-merger. What is more, human buyers are able to extract a portion of both fixed- and variable-cost synergies from the sellers.

In sum, despite a focus on seller pricing behavior, some of the experiments that permit human buyers illustrate a potential moderating effect on sellers' prices. In such cases, the mere presence of human buyers is often sufficient to discipline sellers.

3.2 Buyer Concentration

Numerous cross-sectional empirical studies evaluate the relation between industry buyer concentration ratios and seller profitability.[5] Lustgarten (1975), LaFrance (1979), Martin (1983) and Schumacher (1991) all demonstrate lower price-cost seller margins, the more concentrated the industries to which they sold. Kling's (1988) time-series study of the trucking industry finds a progressive rise in concentration following deregulation in 1980. He argues that increased concentration in trucking has provided a measure of countervailing power against large shippers, not previously needed when rates were state regulated.

Ruffle (2000) is the first experimental study to focus exclusively on strategic buyer

---

[5]Scherer and Ross (1990, pp. 533-535) provide a brief overview of the evidence.

behavior not motivated solely by fairness considerations. This study explores three variables hypothesized to affect posted prices through buyer demand withholding: buyer concentration (two or four buyers), the surplus division between buyers and sellers (each duopolist seller earns six times or three times as much as each buyer) and the degree of information disclosure (full information or full information plus profits). The combination of a highly concentrated buyer side of the market (two) and a six-to-one earnings inequality ratio favoring the sellers yields particularly intense demand withholding, resulting in persistently declining posted prices. The terminal-period posted prices range from 10 to 42 units below the competitive price of 1.90, and 26.5 to 58.5 units below the expected price of the unique mixed-strategy Nash equilibrium. Prices well below the competitive equilibrium constitute a rare departure from the robust posted-offer-market finding that prices "tend to converge to the competitive price prediction from above (if at all) (Davis and Holt 1993, p. 217). This departure attests to the effective withholding of two buyers in these full-information markets.

One possible explanation for two buyers' efficacy is that if one of the two buyers withholds all of his units of demand, then the two sellers must compete in price for the business of the remaining buyer. This may have led to the observed downward spiral in prices. The four-buyer treatments, by contrast, require three of the four buyers to withhold their entire demand schedules for this fierce price competition between sellers to ensue.

Engle-Warnick and Ruffle (2005a) control for price competition between sellers by conducting experiments in which a monopolist faces either two or four buyers. A further design feature that allows them to focus on buyer concentration (also employed in Ruffle (2000)) is the endowment of each buyer in both the two-buyer and four-buyer treatments with the identical individual demand, thereby equating each buyer's opportunity cost of withholding. Engle-Warnick and Ruffle observe significantly lower posted prices in the two-buyer treatment. Interestingly, demand withholding per buyer, per period does not differ significantly between the two treatments. One interpretation of this finding is that the monopolist selects different price levels in the two treatments to calibrate demand

withholding.

To determine the source of lower prices in the two-buyer experiments, the authors design a second pair of two-buyer and four-buyer treatments in which the monopolist only is uninformed about the number of buyers in the market. The disappearance of the price differential and the similar levels of withholding in these uninformed treatments support the cautious monopolist hypothesis; namely, the price differential observed in the original, informed treatments can be explained by the monopolist's cautious reaction to fewer buyers, rather than a reaction to more aggressive withholding at a given price by two buyers than four buyers. Whatever its source, buyer concentration indeed appears to be an effective counterweight to seller market power.

Engle-Warnick and Ruffle (2005b) develop a Bayesian strategy-inference technique and apply it to the dataset in Engle-Warnick and Ruffle (2005a) to estimate each buyer's unobserved withholding strategy that underlies his observed withholding decisions. For about one-quarter of the buyers, the subgame-perfect-equilibrium strategy of passive price taking best describes their behavior. For the remaining three-quarters of the buyers, the authors find active withholding strategies that condition on time, the posted price and a combination of the two variables that best characterize each buyer's behavior. Unconditional, intense withholding early in the game is found to be more effective at lowering the monopolist's price (and no more costly for the buyers) than strategies that trigger withholding above price thresholds or that intensify withholding over time. One plausible explanation for the success of early withholding is that it signals the buyers' unwillingness to accept existing prices. The monopolist thus responds by *lowering* her price to *increase* sales and profits. If buyers do not withhold early on, the monopolist, feeling encouraged, may raise her price and continue to do so until she is met with resistance.

3.3 Large-Buyer Discounts

There are a number of plausible reasons, many modeled theoretically, according to which large buyers obtain a unit-price discount compared to their smaller counterparts. I review

this literature below,[6] and include experimental evidence where available.

Adelman (1959) appears to be the first to articulate the threat of vertical integration as an important source of large-buyer discounts. Adelman's study of the Great Atlantic & Pacific Tea Company (A&P) reveals that A&P's credible threat of profitable in-house production of corn flakes allowed it to leverage a near ten percent reduction with its supplier. Porter (1980, p. 25) includes the credible threat of backward integration among the sources of bargaining power for buyers, noting the success with which General Motors and Ford have employed this strategy. Scherer and Ross (1990, pp. 530-531) discuss several industry studies in which buyers exercised their threat to produce their own inputs. Reeves (2005) notes that several electric-power companies purchased their own freight cars to assure availability. Katz (1987) formally models large buyers' ability to obtain price concessions through their increased threat of vertical integration and self-supply with a production technology exhibiting increasing returns to scale. With applications to agricultural markets in mind, Sexton and Sexton (1987) contrast the deterrence strategies of a monopolist facing entry from either another for-profit firm or a cooperative consisting of downstream buyers. While the for-profit firm's entry decision hinges on the market's post-entry profitability, the pre-entry market price determines the cooperative's entry decision. As a result, limit-pricing strategies (i.e., price discounts to buyers) are usually effective deterrence strategies against a cooperative. In Scheffman and Spiller (1992), despite the presence of customer-specific sunk investments that deter entry, supplier limit pricing results from buyers' credible threat of vertical integration.

In Snyder (1996, 1998), large buyers' threat to a seller comes not from the possibility of self-supply, but from a competing seller. Snyder adapts the framework of Rotemberg and Saloner (1986) who demonstrate that periods of high demand (booms) are most conducive to price wars since current demand is high relative to future demand. Thus, the current benefit from undercutting can exceed the expected loss from future punishment or lost profits. Snyder (1996) allows buyers to accumulate a backlog of unfilled demand, which they may satisfy all at once, thereby endogenizing buyer size. In Snyder (1998), competing

---

[6]See also Snyder (forthcoming) for a survey of the theoretical work on large-buyer discounts.

sellers face a different-sized buyer each period. Large buyers cause sellers to underbid one another aggressively in an attempt to supply the large quantities demanded. To prevent undercutting, sellers collude on lower prices when confronted with a large buyer. Both of Snyder's models are amenable to laboratory tests.

Furthermore, competition between suppliers is often cited as the principal source of superstores' lower costs compared to rival local retail shops. For instance, WalMart's 21,000 suppliers must concede to its mega-buyer's price demands and contract terms or else face replacement by a more conciliatory competing supplier (Fishman 2003). In an empirical study of wholesale prices charged by pharmaceutical manufacturers to buyers who vary in size and substitution opportunities, Ellison and Snyder (2002) show that price discounts depend more on the ability to substitute among alternative suppliers than on sheer buyer size. Ellison and Snyder also conjecture that the failure of numerous collective purchasing internet sites, like Accompany, Ipool, LetsBuyIt, Mercata and MobShop, resulted from these collectives first contracting with a specific manufacturer for a declining price schedule as a function of the number of consumers and only then seeking customers for the item. Their results suggest that a better business model would have been first to obtain the consumers for the item and then force manufacturers to compete in offering the best deal.

Inderst and Shaffer (2004) model two retailers with opposite preferences over the differentiated goods offered by the two suppliers. If the retailers merge, the suppliers are made homogeneous with respect to the merged buyer's preferences. Consequently, the merged buyer need carry only one of the two suppliers' products, causing the suppliers to compete aggressively in price for the merged buyer's patronage.

In addition to the threat of switching suppliers, the goal of maintaining profit margins may also force suppliers of large buyers to become more efficient. Government auctions for construction and defense contracts encourage competing sellers to become leaner. Likewise, Fishman credits WalMart with improving the customer focus, inventory management and speed to market of its supplier Levi Strauss. Moreover, these efficiency gains have benefited other retailers that buy Levi's clothing. The positive externality of buyer

13

power on smaller buyers is the mechanism through which the competitive fringe, and ultimately final consumers, obtain lower prices in Chen (2003). Chen models a monopolist supplier who negotiates with a large downstream buyer and a competitive fringe. An exogenous increase in the large buyer's market power reduces the supplier's share of joint profits. In an attempt to compensate for the reduced profits, the supplier lowers its wholesale price to the fringe, shifting the latter's supply curve to the right. This translates into lower retail prices.

With the objective of lowering retail prices, the monopolist supplier in Tyagi's (2001) model charges a lower input price to the larger of the two downstream manufacturers. Increased differences in the buying firms' equilibrium sizes reduce their attainable level of tacit collusion in the output market. Thus, the supplier chooses to favor the larger buyer to widen the size differential, weaken collusion and maximize its input sales. An interesting implication of this model is that a ban on price discrimination facilitates tacit collusion in the output market and reduces consumer welfare.

Risk aversion is another source of large-buyer discounts. DeGraba (2005) models risk-averse sellers who observe the customer's quantity demanded, but not her valuation. A customer who demands a large quantity represents a riskier profit source than multiple customers with independent valuations whose quantities demanded sum to that of the large buyer. The result is that the risk-averse seller offers a quantity discount to the large buyer. Chae and Heidhues' (2004) setup involves two markets with a seller and a buyer bargaining over the price of a good in each market. If the buyers are risk averse, the authors show that by forming an alliance or merging, the integrated buyer obtains a lower equilibrium price than the separate buyers. The underlying logic is that buyers in the alliance prefer to risk half the negotiated amount in each of two negotiations with the sellers, rather than risk the full amount once as separate buyers in a single negotiation with a seller. Both of these models lend themselves to straightforward, comparative-static tests of the large-buyer-discount prediction.

There are a number of bargaining models that condition quantity discounts not on risk aversion but on the shape of the supplier's gross surplus function. In Chipty and Snyder

14

(1999), a monopoly supplier engages in Nash bargaining with n independent buyers. The authors consider the incentives of two buyers to merge with one another. Absent efficiency effects, a merger confers a bargaining advantage to the merged buyer compared to separate buyers if and only if the supplier's gross surplus function is globally concave. If revenues external to the buyer-supplier contract do not vary with the supplier's total quantity sold, then concavity is equivalent to an increasing marginal cost function.[7] A convex surplus function, by contrast, places the merged buyer at a bargaining disadvantage compared to two separate buyers. The intuition behind these results is that each buyer assumes that all others have reached an equilibrium agreement and views itself as negotiating over the incremental surplus. If the surplus function is concave (increasing marginal costs), then the separate buyer negotiates over a relatively small surplus and, as a result, earns little surplus per unit. The merged buyer, however, negotiates over a larger per-unit surplus and, as a result, earns a larger per-unit surplus in equilibrium by paying a lower per-unit price.

Inderst and Wey (2003) reach a similar conclusion in a bilateral oligopoly framework: buyers choose to merge if supplier production technologies exhibit strictly increasing marginal costs and prefer to stay non-integrated if the opposite holds. The authors also show that a buyer merger induces the supplier to adopt a more efficient production technology. Recall the disciplining effect that WalMart exerts on its suppliers, among them Levi Strauss. On a related note, Farber (1981) concludes from his empirical study of 50 U.S. four-digit industries that for concentrated seller industries sellers' R&D activities increase with buyer concentration. Peters (2001) obtains an analogous result using survey data on the innovation process of German auto parts suppliers.

In Inderst and Wey (2004), the supplier's concave surplus function stems from buyers facing downward-sloping demand in the final-product market. Thus, a merged buyer shrinks the available surplus in the case of negotiation failure, since the supplier must march down smaller buyers' declining marginal surplus functions.

---

[7]In Chipty and Snyder's study of the cable television industry, program-service suppliers earn revenues from advertising that are external to the negotiations between program supplier and cable operators.

Like Chipty and Snyder, Raskovich (2003) models a monopolist supplier that engages in simultaneous, bilateral Nash bargaining with each of n buyers in stage one of the game. If the negotiated contracts cover the supplier's non-sunk fixed costs, the supplier sinks these costs and executes the contracts in the second stage; otherwise, it declares bankruptcy and all payoffs are zero. Raskovich demonstrates that if neither of the two buyers is pivotal to the supplier's production decision pre-merger, but become pivotal post-merger, then the merged buyer pays more than the joint payments of the pre-merger buyers. The reason is that the merged buyer's pivotal position requires it to cover the supplier's shortfall to induce it to produce.

Normann, Ruffle and Snyder (2005) test experimentally these theories that demonstrate a dependence between buyer-size discounts and the curvature of the seller's cost function. They design three separate markets that differ only in the shape of the seller's marginal cost curve (increasing, constant or decreasing marginal costs). Total costs and buyers' valuations are held constant across markets. Three buyers face a single seller in each market. Two buyers are small, with unit demand for the good; the third buyer is large with demand for two units. Costs, valuations and the market structure are all made common knowledge by reading aloud the instructions. In these posted-bid markets, each buyer simultaneously enters a bid to fulfill its given quantity demanded. The seller in each market chooses which bids to reject and accept, with accepted bids yielding the buyer his consumer surplus and the seller his producer surplus; rejected bids yield both parties zero surplus. Each market was conducted for 60 rounds, with each subject's role as a buyer or a seller fixed. However, the cohort of three buyers and one seller and the designation of the large buyer in each market was randomly determined each round to minimize repeated-game effects and to provide within-subject observations across cost structures and buyer sizes.

The posted-bid institution suggests that the appropriate theoretical solution concept for these experiments is subgame perfection, rather than Nash bargaining as in Chipty and Snyder, and Raskovich, or cooperative game theory as in Inderst and Wey. In the case of increasing marginal costs, there exists a unique pure-strategy, subgame-perfect

equilibrium according to which the large buyer pays a lower per-unit price than the small buyers. The constant-marginal-cost case predicts no quantity discount, while the decreasing-marginal-cost case yields a continuum of equilibria, including no discounts.

The experimental results are consistent with the theory. In markets with increasing marginal costs, large buyers bid 12 percent less per unit than their small-buyer cohorts. Moreover, sellers are much more likely to reject a low small-buyer's bid than an equivalent large-buyer's bid, resulting in a 14 percent large-buyer discount when accepted bids are compared. In the constant-marginal-cost and decreasing-marginal-cost markets, large- and small-buyers' bids are not significantly different, neither are sellers' acceptance probabilities.

The laboratory support for these theoretical models is surprising for a number of reasons. First, the demonstrated importance of fairness considerations in surplus-sharing experiments with small numbers of subjects and the considerable strategic uncertainty given the buyers' simultaneous bidding both provide scope for behavioral departures from the predicted buyer-size discounts. More importantly, the experimental confirmation that buyer-size discounts are restricted to markets with decreasing returns to scale contradicts the popular wisdom that large-buyer discounts are ubiquitous.[8] Moreover, when asked, economists typically express the belief that large-buyer discounts are most likely to arise in the presence of economies of scale. Porter's (1980) statement that "large-volume discounts are particularly potent forces if heavy fixed costs characterize the industry – as they do in corn refining and bulk chemicals, for example – and raise the stakes to keep capacity filled" (p. 24) succinctly captures this intuition. Indeed, if the supplier's production function exhibits increasing returns to scale and the supplier serves one buyer each production period, per-unit production costs decline with buyer size (Snyder forthcoming).

Economies of distribution represent another cost-based explanation for large-buyer

---

[8]Indeed, collective purchasing websites spanning a range of consumer goods were established on the premise that the larger the buyer, the better the volume discount attainable from the manufacturer, irrespective of its cost structure. The uniform failure of these sites suggests that size is not sufficient to yield substantial discounts. See also Ellison and Snyder (2002) for a discussion of this point.

discounts. They exist when the seller's average cost of serving a large buyer is lower than serving a small buyer. For example, the average fixed costs of putting together an order, billing and shipping to a large retail outlet or its warehouse are lower than those associated with a smaller retailer. Additionally, the industrial price of electricity is substantially lower than the residential price because, compared to residential consumers, industrial consumers i) connect higher up in the transmission and distribution networks; ii) involve the same fixed cost for reading and billing electricity meters but amortize this cost over a much larger volume; iii) consume a smaller fraction of their electricity during peak-load times.[9] The separation of the economies-of-distribution explanation from other previously discussed sources of bargaining power related to buyer size is a topic suitable for experimental investigation.

One question left unanswered by most of this literature is whether the lower prices obtained by a large buyer or a highly concentrated buying side of the market are passed on to final consumers. von Ungern-Sternberg (1996) models a two-stage game in which a producer Nash bargains with n identical retailers who then act either as Cournot competitors or price takers on the final-product market. As the number of retailers decreases, equilibrium consumer prices are unambiguously shown to increase in the Cournot model and to decrease in the perfect-competition model. Dobson and Waterson (1997) obtain an analogous result: in their two-stage game, a monopolist supplier negotiates with *differentiated* retailers in the first stage who then compete in price for customers in the second stage. They show that a decline in the number of retailers leads to lower final prices only when retailers' services are sufficiently substitutable. Finally, as previously discussed, Chen (2003) shows that in response to an increase in the large buyer's market power, the monopolist supplier lowers its price to the competitive fringe. Lower retail prices result. These theoretical models beg experimental tests that include not only the usual negotiation between wholesalers and retailers, but an additional stage of competition between retailers for consumer demand.

---

[9]I owe these insights on electricity distribution to personal communications with Faye Steiner and Frank Wolak.

4 Conclusion

The recent rise in North America and Europe of the general merchandise mega-retailer (e.g. WalMart, Costco and Target) as well as specialized mega-retailers in areas like food, pharmaceuticals, electronics, toys, home renovation, car, gardening and office supplies appears to have spawned a spate of research on the countervailing role of buyers. Although intended as a survey of experimental evidence, this paper also unavoidably devotes considerable space to outlining the burgeoning theoretical literature as well as some of the empirical evidence on buyer countervailing power. In doing so, the contrast between the wealth of recent explanations for buyer power and the dearth of experimental tests is striking. This gap between theory and experiments is unfortunate given the inherent facility with which many of these theories may be evaluated experimentally.

Buyer power is most relevant in non-retail markets, precisely those markets in which price contracts, and cost and demand data are most difficult to obtain. Accordingly, experiments allow the researcher to assign sellers' costs and buyers' valuations, and to select the market structure of interest; prices are then the behavioral outcomes of these chosen variables. By highlighting sources and specific theories of buyer countervailing power, it is my hope that researchers will take advantage of the control offered by experimental methods to test these theories for which, currently, no more than anecdotal evidence exists.

The main implications of buyer countervailing are a subject of much contention and recent debate. On the one hand, where effective, buyer power constitutes a valuable check against seller power and, in this regard, may be seen as a substitute for antitrust legislation. On the other hand, if powerful buyers are also powerful sellers in the final product market, then price discounts may not be passed on to final consumers. Whether final consumers ultimately benefit from countervailing power is a topic particularly ripe for experimental research. In addition to price discounts, countervailing power may manifest itself in less benign forms: antitrust authorities need to be concerned with vertical contractual arrangements like exclusive dealing, fees extracted for store shelf space and

19

most-favored-customer clauses.[10]

Regardless of the overall welfare and efficiency effects of countervailing power, the increasing policy relevance of this topic is indisputable for two reasons. First, Steuer (2004) makes the point that the phenomenon of outsourcing creates countervailing power. Growing corporations strive to maintain their profit margins often by cutting costs and specializing production through outsourcing some aspect of their business (e.g., product distribution, supply of inputs). These corporations assume the role of powerful buyers toward their new suppliers, bringing to bear their buying power, knowledge of the cost structure and ability to self-supply or switch suppliers. Second, the worldwide trends away from industrial regulation (i.e., toward deregulation) and toward increased industrial concentration, resulting primarily from an ongoing horizontal merger wave (see, e.g., Pryor 2001), challenges buyers to respond strategically and exert a countervailing force. The aforementioned growth of mega-retailers is an indication that they have risen to the challenge.

References

Adelman, M. A. (1959) *A&P: A Study in Price-Cost Behavior and Public Policy*, Cambridge, MA: Cambridge University Press.

Brown-Kruse, J. (1991) "Contestability in the presence of an alternate market: an experimental investigation," *RAND Journal of Economics*, 22:1, 136–147.

Cason, T. N. and A. W. Williams (1990) "Competitive Equilibrium Convergence in a Posted-Offer Market with Extreme Earnings Inequalities," *Journal of Economic Behavior and Organization*, 14, 331–352.

Chae, S. and P. Heidhues (2004) "Buyers' Alliances for Bargaining Power," *Journal of Economics and Management Strategy*, 13:4, 731–754.

---

[10]These practices are discussed at length in the European Commission's (1999) report on buyer power and the food retailing industry in Europe.

Chen, Z. (2003) "Dominant Retailers and the Countervailing Power Hypothesis," *RAND Journal of Economics*, 34:4, 612–625.

Chipty, T. and C. M. Snyder (1999) "The Role of Firm Size in Bilateral Bargaining: A Study of the Cable Television Industry," *Review of Economics and Statistics*, 81, 326–340.

Coursey, D., R. M. Isaac and V. Smith (1984) "Natural Monopoly and Contested Markets: Some Experimental Results," *The Journal of Law and Economics*, 27, 91–113.

Davis, D. D., and C. A. Holt (1993) *Experimental Economics*, Princeton, NJ: Princeton University Press.

Davis, D. and A. Williams (1990) "Market Power and the Institutional Asymmetry of the Posted-Offer Trading Institution," *Economics Letters*, 34, 211–214.

Davis, D. and A. Williams (1991) "The Hayek Hypothesis in Experimental Auctions: Institutional Effects and Market Power," *Economic Inquiry*, 29, 261–274.

Davis, D. D. and B. J. Wilson (2004) "Strategic Buyers, Horizontal Mergers and Fixed Cost Synergies: An Experimental Investigation," mimeo.

DeGraba, P. (2005) "Quantity Discounts from Risk Averse Sellers," Federal Trade Commission, mimeo.

Dobson, P. W. and M. Waterson (1997) "Countervailing Power and Consumer Prices," *Economic Journal*, 107, 418–430.

Ellison, S. and C. M. Snyder (2002) "Countervailing Power in Wholesale Pharmaceuticals," M.I.T. mimeo.

Engle-Warnick, J. and B. J. Ruffle (2005a) "Buyer Concentration as a Source of Countervailing Power: Evidence from Experimental Posted-Offer Markets," Ben-Gurion University, mimeo.

Engle-Warnick, J. and B. J. Ruffle (2005b) "The Strategies Behind their Actions: A Method to Infer Repeated-Game Strategies and an Application to Buyer Behavior," Ben-Gurion University, mimeo.

European Commission (1999) *Buyer Power and Its Impact on Competition in the Food Retail Distribution Sector of the European Union*, Luxembourg: Office for Official Publications of the European Communities.

Farber, S. (1981) "Buyer Market Structure and R&D Effort: A Simultaneous Equations Model," *Review of Economics and Statistics*, 62, 336–345.

Fishman, C. (2003) "The WalMart You Don't Know," *Fast Company*, December:77, 68.

Franciosi, R., P. Kujal, R. Michelitsch, V. Smith and G. Deng (1995) "Fairness: effect on temporary and equilibrium prices in posted-offer markets," *Economic Journal*, 105:431, 938–950.

Friedman, J. (1967) "An Experimental Study of Cooperative Duopoly," *Econometrica*, 35, 379–397.

Galbraith, J. K. (1952) *American Capitalism: The Concept of Countervailing Power*, Boston, MA: Houghton Mifflin, chapter 9.

Güth, W., R. Schmittberger, and B. Schwarze (1982) "An experimental analysis of ultimatum bargaining," *Journal of Economic Behavior and Organization*, 3, 367–388.

Hunter, A. (1958) "Notes on Countervailing Power," *Economic Journal*, 68:269, 89–103.

Inderst, R. and C. Wey (2003) "Bargaining, Mergers, and Technology Choice in Bilaterally Oligopolistic Industries," *RAND Journal of Economics*, 34: 1–19.

Inderst, R. and C. Wey (2004) "Buyer Power and Supplier Incentives," London School of Economics, mimeo.

Inderst, R. and G. Shaffer (2004) "Retail Mergers, Buyer Power and Product Variety," London School of Economics, mimeo.

Kachelmeier, S. J., S. T. Limberg and M. S. Schadewald (1991a) "A laboratory market examination of the consumer price response to information about producers' cost and profits," *Accounting Review*, 66:4, 694–717.

Kachelmeier, S. J., S. T. Limberg and M. S. Schadewald (1991b) "Fairness in Markets: A laboratory investigation," *Journal of Economic Psychology*, 12, 447–464.

Kahneman, D., J. Knetsch and R. Thaler (1986) "Fairness as a Constraint on Profit Seeking," *American Economic Review*, 76:4, 728–741.

Katz, M. L. (1987) "The Welfare Effects of Third Degree Price Discrimination in Intermediate Goods Markets," *American Economic Review*, 77, 154–167.

Kling, R. W. (1988) "Trucking Deregulation: Evolution of a New Power Structure," *Journal of Economic Issues*, 22:4, 1201–1211.

Kritikos, A. and F. Bolle (2004) "Punishment as a public good: When should monopolists care about a consumer boycott?" *Journal of Economic Psychology*, 25, 355–372.

Lustgarten, S. H. (1975) "The Impact of Buyer Concentration in Manufacturing Industries," *Review of Economics and Statistics*, 57:2, 125–132.

Martin, S. (1983) "Vertical Relationships and Industrial Performance," *Quarterly Review of Economics and Business*, 23, 6–18.

McGuckin, R. and H. Chen (1976) "Interactions between buyer and seller concentration and industry price-cost margins," *Industrial Organization Review*, 4, 123–132.

Normann, H. T., B. J. Ruffle and C. M. Snyder (2005) "Do Buyer-Size Discounts Depend on the Curvature of the Surplus Function? Experimental Tests of Bargaining Models," Ben-Gurion University, mimeo.

Peters, J. (2000) "Buyer Market Power and Innovative Activities: Evidence for the German Automobile Industry," *Review of Industrial Organization*, 16, 13–38.

Porter, M. E. (1980) *Competitive Strategy: Techniques for Analyzing Industries and Competitors*, New York, NY: Free Press, chapter 1.

Pryor, F. L. (2001) "New Trends in U.S. Industrial Concentration," *Review of Industrial Organization*, 18, 301–326.

Raskovich, A. (2003) "Pivotal Buyers and Bargaining Position," *Journal of Industrial Economics*, 51, 405–426.

Reeves, S. (2005) "On Track for A Good Deal," *Forbes.com*, April 1.

Rotemberg, J. and G. Saloner (1986) "A supergame-theoretic model of business cycles and price wars during booms," *American Economic Review*, 76, 390–407.

Ruffle, B. J. (2000) "Some Factors Affecting Demand Withholding in Posted-Offer Markets," *Economic Theory*, 16, 529–544.

Scheffman, D. T. and P. T. Spiller (1992) "Buyers' Strategies, Entry Barriers, and Competition," *Economic Inquiry*, 30, 418–436.

Scherer, F. M. and D. Ross (1990) *Industrial Market Structure and Economic Performance*, 3rd ed., Houghton Mifflin: Boston, MA.

Schumacher, U. (1991) "Buyer Structure and Seller Performance in U.S. Manufacturing Industries," *Review of Economics and Statistics*, 73:2, 277–284.

Selten, R. and R. Stoecker (1986) "End Behavior in Sequences of Finite Prisoner's Dilemma Supergames: A Learning Theory Approach," *Journal of Economic Behavior and Organization*, 7, 47–70.

Sexton, R. J. and T. A. Sexton (1987) "Cooperatives as Entrants," *RAND Journal of Economics*, 18:4, 581–595.

Smith, V. L. (1981) "An Empirical Study of Decentralized Institutions of Monopoly Restraint," in *Essays in contemporary fields of economics in honor of E.T. Weiler (1914-1979)*, J. Quirk and G. Horwich (eds.), West Lafayette, IN: Purdue University Press, 83–106.

Snyder, C. M. (1996) "A Dynamic Theory of Countervailing Power," *RAND Journal of Economics*, 27, 747–769.

Snyder, C. M. (1998) "Why Do Large Buyers Pay Lower Prices? Intense Supplier Competition," *Economics Letters*, 58, 205–209.

Snyder, C. M. (forthcoming) "Countervailing Power," in S. Durlauf and L. Blume (eds.), *The New Palgrave Dictionary of Economics*, 2nd edition, London: Palgrave Macmillan.

Steuer, R. M. (2004) "Blindside Deconcentration: Outsourcing, Power Retailers, and Antitrust, *theantitrustsource*, March, 1-8, available at www.antitrustsource.com.

Tyagi, R. K. (2001) "Why Do Suppliers Charge Larger Buyers Lower Prices?" *Journal of Industrial Economics*, 49, 45–61.

Tyran, J. R. and D. Engelmann (2005) "To Buy or Not to Buy? An Experimental Study of Consumer Boycotts in Retail Markets," *Economica*, 72, 1–16.

United States District Court for the District of Columbia (1998) "FTC v. Cardinal Health, Inc. and Bergen-Brunswig Corp. and FTC v. McKesson Corp. and AmeriSource Health Corp.," available at http://www.ftc.gov/os/caselist/ca98595ddc.htm.

von Ungern-Sternberg, T. (1996) "Countervailing Power Revisited," *International Journal of Industrial Organization*, 14, 507–520.

van Damme, E., L. Hancher, P. Larouche and W. Muller (forthcoming) "Experiments on the Abuse of a Dominant Position," in *Experiments and Antitrust Policy*, J. Hinloopen and H. T. Normann (eds.) Cambridge, U.K.: Cambridge University Press.