

ON THE INCIDENCE AND VARIETY OF LOW-PRICE GUARANTEES*

MARIA ARBATSKAYA,
Emory University

MORTEN HVIID,
University of East Anglia

and

GREG SHAFFER
University of Rochester

ABSTRACT

This paper provides evidence of the incidence and variety of low-price guarantees (promises to match or beat a rival's price) using data obtained from newspaper advertisements in 37 metropolitan areas in the United States. We have a total of 515 low-price guarantees in our sample. We document their features, and we infer firms' motives and effects from these features. The evidence suggests that the majority of low-price guarantees are not consistent with their use as a facilitating device because they tend to apply only to rival firms' advertised prices or they are associated with high hassle costs. The evidence also suggests that price-beating and price-matching guarantees differ significantly in their features. The former are associated with higher hassle costs, apply disproportionately to rival firms' advertised prices, and are more likely to allow postsale search than are price-matching guarantees.

I. INTRODUCTION

LOW-PRICE guarantees, in which retailers promise not to be undersold by competitors, are commonplace, and they are often found at the forefront of firms' pricing policies and advertisements. In one well-known ad campaign, for example, an electronics chain encourages a father to "go ahead, take it" and purchase a 27-inch television for his son now, without waiting, stating that if a competitor were to offer a lower price, or if the chain itself were

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to lower the price of the television in the future, it (the chain) would refund to him the difference in price plus 10 percent.¹

Although these guarantees are typically portrayed in TV and newspaper advertisements as being advantageous for consumers, conjectures abound about why they may instead be undesirable (theorists typically do not distinguish among the many varieties of low-price guarantees). Beginning with the seminal works of George Hay and Steven Salop, the dominant view in the economics literature is that low-price guarantees raise equilibrium prices and hence facilitate tacit collusion because they alter firms' incentives to cut prices.² It is thus not surprising that low-price guarantees have drawn the attention of legal scholars and policy makers. They have been categorized as a facilitating practice in many law textbooks, and they are discussed with disapproval in several law review articles.³ Aaron Edlin, for example, suggests that low-price guarantees are anticompetitive and should be challenged either as a violation of the Sherman Act or as illegal price discrimination under the Robinson-Patman Act.⁴

However, despite the extensive literature on this topic, and periodic calls for the practice's regulation, there is little empirical work to support (or reject) the claims of those who believe that low-price guarantees are anti-competitive. In this paper, we will document the incidence of low-price guarantees in general and their different varieties, and we will describe their features. We will then infer firms' motives and effects from these features. Of particular interest is whether and to what extent the low-price guarantees in our sample have features that are consistent with their use as facilitating devices. We are also interested in identifying and exploring the similarities and differences between price-matching and price-beating guarantees and in identifying important topics for future research.

Our data consist of 515 low-price guarantees taken from the advertisements

¹ Circuit City's Price-Match Plus policy, as seen on television during the Orange Bowl game, January 4, 2003.

² George Hay, Oligopoly, Shared Monopoly, and Antitrust Law, 28 Cornell L. Rev. 439 (1982); Steven Salop, Practices That (Credibly) Facilitate Oligopoly Coordination, in *New Developments in the Analysis of Market Structure* 265 (Joseph Stiglitz & G. Frank Mathewson eds. 1986).

³ See the law textbooks by Milton Handler *et al.*, *Cases and Materials on Trade Regulation: Cases and Materials* 313 (3d ed. 1990); and Herbert Hovenkamp, *Federal Antitrust Policy: The Law of Competition and Its Practice* 183 (2d ed. 1999). See also Donald S. Clark, Price-Fixing without Collusion: An Antitrust Analysis of Facilitating Practices after Ethyl Corp., 1983 Wis. L. Rev. 887; Aaron S. Edlin, Do Guaranteed-Low-Price Policies Guarantee High Prices, and Can Antitrust Rise to the Challenge? 111 Harv. L. Rev. 528 (1997); Joseph J. Simons, Fixing Price with Your Victim: Efficiency and Collusion with Competitor Based Formula Pricing Clauses, 17 Hofstra L. Rev. 599 (1989); Mark T. L. Sargent, Economics Upside-Down: Low-Price Guarantees as Mechanisms for Facilitating Tacit Collusion, 141 U. Pa. L. Rev. 2055 (1993); and M. Weiner, Facilitating Practices: Distinguishing the Legitimate from the Unlawful, 7 Antitrust 22 (1993).

⁴ See Edlin, *supra* note 3.

of retail outlets in 61 Sunday newspapers in 37 metropolitan areas throughout the United States. We observe a wide variety of low-price guarantees across many product categories.⁵ Some low-price guarantees promise to match a competitor's price; others promise to beat a competitor's price. Some low-price guarantees apply to a rival's advertised prices only; others apply to a competitor's best deal. Some low-price guarantees allow consumers to search for lower prices postsale—anywhere from 2 days to the lifetime of the product; the majority do not. Of the low-price guarantees that do allow postsale search, some include their own future prices (as in the guarantee quoted above); others do not. Some low-price guarantees require consumers to provide written proof of a competitor's lower price or to seek out a store manager; others restrict the applicability of their low-price guarantees to certain products, competitors, or geographic areas.

Most of the literature on low-price guarantees glosses over these differences as if they were inconsequential. However, recently, theory has shown that two factors in particular are critical in determining whether and to what extent low-price guarantees can support high prices: (1) hassle costs and (2) whether low-price guarantees apply to advertised or selling prices. Morten Hviid and Greg Shaffer show that hassle costs can undermine the ability of low-price guarantees to support high prices, and articles by Edlin and Todd Kaplan show that, to support high prices, the guarantees must apply to selling prices.⁶ Thus, theory suggests that guarantees that mitigate hassle costs and apply to a rival's selling price are the most conducive to facilitating high prices, whereas guarantees that engender high hassle costs or apply only to a rival's advertised price are the least conducive to facilitating high prices.

Our data set provides us with information on the level of hassle costs (which we proxy by the number of restrictions in each guarantee) and whether the guarantee applies to a rival's advertised price only or also to its selling price. Using this information, we can then infer whether low-price guarantees are being used to facilitate high prices and whether there are differences between price-matching and price-beating guarantees that might indicate they are being used for different purposes.

The evidence suggests that the majority of low-price guarantees are not consistent with facilitating high prices because they apply only to rivals' advertised prices or are associated with high hassle costs. Surprisingly, we

⁵ We find low-price guarantees on big-ticket items (for example, computers, furniture, and vacation tours) and small-ticket items (for example, books, housewares, office products, and toys). We find them on seasonal products (for example, Christmas decorations) and year-round services (for example, dry cleaning). Some of the items are easily compared across stores (for example, cameras and software), while other items (for example, mattresses and hotel accommodations) are not. In all, we have more than 50 categories of products and services in our sample.

⁶ Morten Hviid & Greg Shaffer, *Hassle Costs: The Achilles Heel of Price-Matching Guarantees*, 8 *J. Econ. & Mgmt. Strategy* 489 (1999); Edlin, *supra* note 3; and Todd R. Kaplan, *Effective Price-Matching: A Comment*, 18 *I. J. Indus. Org.* 1291 (2000).

find that price-beating guarantees are much less likely to be consistent with facilitating high prices than are price-matching guarantees. Over 90 percent of price-beating guarantees have features that are inconsistent with facilitating high prices, whereas only 44 percent of price-matching guarantees have such features. This is surprising because one might think that price-beating guarantees would be more effective at facilitating high prices than price-matching guarantees, not less effective, given their potential to deliver more severe punishment in the event of a price cut.

The evidence also suggests that price-beating and price-matching guarantees differ significantly in their features. The former are associated with higher hassle costs, apply disproportionately to advertised prices, and are more likely to allow postsale search than are price-matching guarantees. For example, only 22 percent of the price-matching guarantees allow consumers to search for lower prices postsale, whereas more than 90 percent of the price-beating guarantees in our sample have this feature.

We posit that firms may allow postsale search to induce consumers to buy now rather than wait (recall the stated purpose of the low-price guarantee in the electronics chain's attempt to induce the father to purchase the television for his son). One reason consumers may prefer to wait before purchasing an item from a given retailer is that they are uncertain about whether the product will go on sale in the future. Another reason consumers may prefer to wait is that they are uncertain about whether they will find a lower price on the same product elsewhere if they continue searching. In both instances, low-price guarantees that allow postsale search may induce consumers to accelerate their purchase decisions (the "buy-now" effect). However, we would expect the low-price guarantees that induce the buy-now effect in these two scenarios to differ in content. Thus, for example, a firm might be more likely to combine its low-price guarantee with a most-favored-customer clause and allow for a longer search time if it believes that consumers are concerned about the product going on sale in the future rather than that consumers are merely reluctant to purchase because they have yet to finish their comparison shopping.⁷ We find that the evidence supports this conjecture.

Section II discusses related literature on low-price guarantees. Section III describes the data and documents the incidence and variety of low-price guarantees. Section IV discusses the inferences that can be made on the basis of the number of restrictions found in each guarantee and whether the guarantee applies to rivals' advertised prices or actual selling prices. Section V focuses on the role of postsale search and most-favored-customer clauses in low-price guarantees. Section VI concludes.

⁷ Most-favored-customer clauses insure a buyer purchasing today against the possibility that the seller may lower its price in the future. If the seller does so, the buyer purchasing today is entitled to a refund of at least the difference.

II. BACKGROUND ON RELATED LITERATURE

In the simplest anticompetitive story involving low-price guarantees, two firms with constant marginal costs sell a homogeneous product to fully informed consumers and there are no hassle costs. In the absence of price-matching guarantees, Bertrand competition leads to marginal-cost pricing for the usual reasons. However, with price-matching guarantees, there exists an equilibrium in which each firm adopts a price-matching guarantee and prices at the monopoly level. Collusive prices are supportable because neither firm has an incentive to undercut the other since each is committed to matching the lowest price. This result, which we attribute to the seminal works of Hay and Salop, has been extended to $n > 2$ firms and price-beating guarantees.⁸ It has been shown to be robust to whether the guarantees and prices are chosen simultaneously or sequentially and to whether the firms' products are identical or asymmetrically differentiated.⁹ It has also been applied to address important issues relating to product variety, deadweight loss, and entry deterrence.¹⁰

However, Hviid and Shaffer point out that this monopoly-pricing result can unravel if consumers incur hassle costs when requesting refunds.¹¹ For example, in the case of price-matching guarantees, any price difference will cause all consumers to patronize the firm with the lower price, and in the case of price-beating guarantees, a sufficiently small price difference will cause all consumers to patronize the firm with the lower price. No consumer will invoke price-matching or price-beating guarantees if the cost of doing so exceeds the expected gain. Hviid and Shaffer also show that when the products are differentiated (consumers may have diverse preferences over store location), nonzero hassle costs significantly hinder the ability of firms to raise prices using low-price guarantees. Higher hassle costs in their model imply weakly lower equilibrium prices.

⁸ See Hay, *supra* note 3; and Salop, *supra* note 3. For the extension to $n > 2$ firms, see Christopher Doyle, Different Selling Strategies in Bertrand Oligopoly, 28 *Econ. Letters* 387 (1988). For the extension to price-beating guarantees, see Avinash Dixit & Barry Nalebuff, *Thinking Strategically* (1991).

⁹ See Zhiqi Chen, How Low Is a Guaranteed-Lowest Price? 28 *Can. J. Econ.* 683 (1995); and John W. Logan & Randall W. Lutter, Guaranteed Lowest Prices: Do They Facilitate Collusion? 31 *Econ. Letters* 189 (1989).

¹⁰ See Z. John Zhang, Price-Matching Policy and the Principle of Minimum Differentiation, 43 *J. Indus. Econ.* 287 (1995) (on product variety); Aaron S. Edlin & Eric Emch, The Welfare Losses from Price-Matching Policies, 47 *J. Indus. Econ.* 145 (1999) (on deadweight loss); and Maria Arbatskaya, Can Low-Price Guarantees Deter Entry? 19 *Int'l J. Indus. Org.* 1387 (2001) (on entry deterrence). For models with a price discrimination motive, see I. P. L. Png & D. Hirshleifer, Price Discrimination through Offers to Match Price, 60 *J. Bus.* 365 (1987); Kenneth S. Corts, On the Competitive Effects of Price-Matching Policies, 15 *Int'l J. Indus. Org.* 283 (1997); and Yuxin Chen, Chakravrthi Narasimhan, & Z. John Zhang, Consumer Heterogeneity and Competitive Price-Matching Guarantees, 20 *Marketing Sci.* 300 (2001).

¹¹ See Hviid & Shaffer, *supra* note 6.

The monopoly-pricing result has also been criticized in papers by Kenneth Corts and by Hviid and Shaffer.¹² Corts posits a model with homogeneous firms and shows that the way to undercut a rival is to adopt a price-beating guarantee and post a higher price. The difference in posted prices causes the firm's guarantee to be invoked, which results in a lower effective price. Thus, Corts argues that Salop's insight is not robust and that marginal-cost pricing is the only equilibrium. Hviid and Shaffer extend this result to a model with asymmetrically differentiated products and also find that low-price guarantees have no effect on equilibrium prices when price-beating guarantees are feasible. However, subsequent literature has shown that the Corts and the Hviid and Shaffer results implicitly assume that the low-price guarantees apply to advertised prices and not to selling prices. For example, the firm that adopts the price-beating guarantee and raises its advertised price in Corts's model can achieve a lower effective price only provided that its rival's low-price guarantee is not activated, which is the case only if its rival's low-price guarantee is limited to advertised prices. As argued in the articles by Edlin and Kaplan, the ability of low-price guarantees to support supracompetitive prices is restored if the low-price guarantees apply to selling prices.¹³

The empirical evidence on low-price guarantees is thin. Part of the problem is that it is difficult to construct the counterfactual "what would each firm's price be if no firm had a low-price guarantee?" James Hess and Eitan Gerstner come the closest to this ideal because they have data on prices before and after a local supermarket adopted a price-matching policy.¹⁴ They show that price-matching guarantees result in greater conformity in prices and slightly higher market-average prices for products included in the guarantee relative to those not covered by the guarantee. It is unknown to what extent these findings reflect the specific institutional features of the market they study.¹⁵

Maria Arbatskaya and coworkers conducted a cross-sectional study (across markets and cities) to analyze the effects of low-price guarantees on the retail prices of a particular tire, P185/75R14.¹⁶ They find that although a tire re-

¹² See Kenneth S. Corts, On the Robustness of the Argument That Price-Matching Is Anti-competitive, 47 *Econ. Letters* 417 (1995); and Morten Hviid & Greg Shaffer, Do Low-Price Guarantees Facilitate Tacit Collusion? (Working Paper No. 94-02, Univ. Michigan 1994).

¹³ See Edlin, *supra* note 3; and Kaplan, *supra* note 6.

¹⁴ See James Hess & Eitan Gerstner, Price Matching Policies: An Empirical Case, 12 *Mgmt. Decision Econ.* 305 (1991). One supermarket in their study had a price-matching guarantee throughout the period of study, which complicates the interpretation of their results. For example, it may be that most of the price-raising effects of low-price guarantees occur when the first firm adopts a guarantee and that subsequent adoption raises prices very little.

¹⁵ The supermarkets studied by Hess and Gerstner, *id.*, matched the prices of the low-price supermarket, Food Lion, by automatically lowering the shelf prices of their products. They also regularly published extensive price lists for the products included under their guarantees (over 9,000 items). In most other industries, however, firms do not publish extensive price lists, and they match or beat lower prices selectively—only for consumers who ask for refunds.

¹⁶ See Maria Arbatskaya, Morten Hviid, & Greg Shaffer, Promises to Match or Beat the Competition: Evidence from Retail Tire Prices, 8 *Advances Applied Microecon.* 123 (1999).

tailer's own price-matching or price-beating guarantee has no significant effect on the retailer's advertised tire price, an increase in the percentage of firms in the same market announcing low-price guarantees tends to raise the firm's advertised tire price. They do not distinguish between low-price guarantees that apply to advertised prices and those that apply to selling prices, nor do they consider hassle costs, which are key features of our analysis.

III. INCIDENCE AND VARIETY OF LOW-PRICE GUARANTEES

In this section, we provide the first documentation in the literature of the incidence of low-price guarantees in general and of their many different varieties. The data we use were collected from advertisements placed by firms in 61 Sunday newspapers dated between September 29, 1996, and December 8, 1996. The newspapers, which were back issues of unsold stock of a national retailing chain, represent 37 different cities in the United States.

The names of the cities and the mean number of low-price guarantees that were found in each city's newspaper are shown in Figure 1. We collected 515 low-price guarantees from advertisements placed by 234 different firms. There are more guarantees than firms because some firms advertised low-price guarantees in more than one metropolitan area (for example, we have low-price guarantees from Circuit City in 16 different cities) and some advertised multiple low-price guarantees on the same date in the same city (for example, Office Max).

For each low-price guarantee, we have collected information about the actual wording of the guarantee; for example, does the low-price guarantee promise to match or beat rival firms' prices, does the low-price guarantee apply to lower prices found by a consumer postsale, and does the low-price guarantee contain a most-favored-customer clause? We have also noted all restrictions in each low-price guarantee, and we have taken care to record to what the low-price guarantee applies, that is, whether it applies to rival firms' advertised prices only or to their actual selling prices.

One potential source of bias in the data is the representativeness of the included cities. To address this issue, we looked at the circulation figures in 1996 of the top 50 U.S. Sunday newspapers, of which 37 are in our data set, and the circulation figures in 1996 of the top 25 U.S. Sunday newspapers, of which 18 are in our data set. As it turns out, the mean and variance of the circulation of the top 27 (18) newspapers in our sample are not significantly different from the mean and variance of the circulation of the top 50 (25) U.S. Sunday newspapers, with a value for the t -test of .824 and a value for the F -test of 1.128.

A. *Classification of Low-Price Guarantees*

Low-price guarantees can be classified as either price matching (PM) or price beating (PB). Under PM guarantees, a firm promises to match any

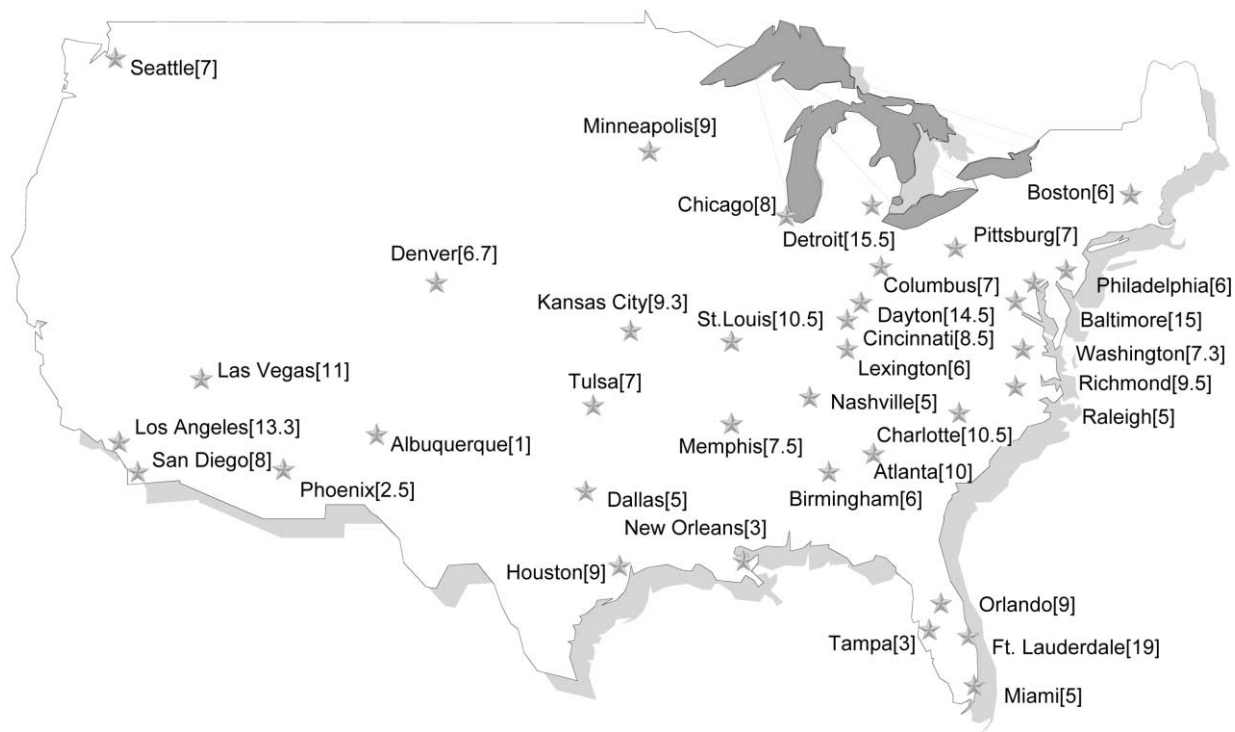


FIGURE 1.—Map of the United States that indicates cities for which we have newspapers

TABLE 1
INCIDENCE OF LOW-PRICE GUARANTEES

	PRICE MATCHING	PRICE BEATING			TOTAL
		PBΔ	PB%	PB\$	
LPGs (%)	325 (63)	163 (32)	21 (4)	6 (1)	515
Firms (%)	182 (73)	48 (19)	12 (5)	6 (2)	248

NOTE.—Total (relative) values are presented. LPG: low-price guarantee; PBΔ: a guarantee to beat a competitor's lower price by $\lambda\%$ of the price difference; PB%: a guarantee to beat a competitor's price by $\phi\%$; PB\$: a guarantee to beat a competitor's price by \$X.

lower price by a competitor (refund 100 percent of the price difference). Under PB guarantees, a firm promises to beat any lower price by a competitor or, in some cases, to beat any price. Although the literature focuses on PM guarantees and a particular kind of PB guarantee, PB by a percentage of the difference in prices, there are actually three types of PB guarantees:¹⁷

1. PBΔ guarantee: a guarantee to beat a competitor's lower price by $\lambda\%$ of the price difference. For example, "If, within 30 days of your purchase from Best Buy, you find a local competitor offering a lower price on an available product of the same brand and model, we'll refund the difference plus another 10% of the difference."

2. PB% guarantee: a guarantee to beat competitor prices by $\phi\%$ (or beat any lower price by $\phi\%$). For example, "Try to beat us—but you won't. We guarantee to beat local competition by 3% for identical product. Price guarantee for non-sale retail prices only."

3. PB\$ guarantee: a guarantee to beat competitor prices by \$X (or beat any lower price by \$X). For example, "Search this newspaper for the best price you can find on a new Ford, because . . . Person Ford/KIA will beat any advertised price by: \$500! Guaranteed!"

The incidence of each type of low-price guarantee (LPG) is presented in Table 1, where both the total and relative number of LPGs and number of firms offering a given type of LPG is shown.

As we might expect from the literature's focus, the most common type of LPG is the PM guarantee, which occurs in nearly two-thirds of the LPGs and is adopted by almost three-fourths of the firms, and the most common type of PB guarantee is PBΔ, which occurs in nearly one-third of the LPGs and is adopted by almost one-fifth of the firms. Either PM or PBΔ guarantees are adopted by 92 percent of all firms, and together they account for 95

¹⁷ The following three ads are for Best Buy, Detroit News, October 13, 1996, insert; Micro Direct, Dayton Daily News, December 1, 1996, at 8A; and Person Ford/KIA, L.A. Times, December 1, 1996, insert.

percent of all LPGs in our sample.¹⁸ There are 21 PB% guarantees (12 firms). Of these, nine PB% guarantees (five firms) promise to beat by $\phi\%$ any price by a competitor, and the rest promise to beat a competitor's price by $\phi\%$ only if the competitor has a lower price. There are six PB\$ guarantees (six firms). Two of the PB\$ guarantees are triggered only if a competitor has a lower price. The other four promise to beat competitor prices outright.

In determining the total number of LPGs, we have not counted advertisements in which firms simply stated that their prices were unbeatable. Instead, we included in Table 1 only advertisements in which a firm either "promised" low prices or "guaranteed" low prices.¹⁹

If the wording of a firm's LPG was ambiguous, for example, when a firm promised to beat any rival's price but did not say by how much, we classified the LPG as PM. Some firms' LPGs had elements of both PM and PB. For instance, some firms promised to match a competitor's lower price if requested by the consumer prior to purchase and to beat a competitor's lower price if requested by the consumer afterward. Because an informed consumer can always buy the product before requesting a refund, thereby qualifying for the higher refund, we classified these LPGs as PB, according to their after-purchase guarantee.

IV. INFERENCES ABOUT WHETHER LOW-PRICE GUARANTEES ARE FACILITATING

In this section, we shift our focus from documenting the incidence and variety of LPGs to documenting their features and then inferring firms' motives and effects from these features. The dominant view in the literature is that LPGs are adopted to facilitate tacit collusion. Ideally, we would want to test this view directly with before and after data on prices. Unfortunately, this is not possible for us given our data. However, we can nevertheless draw inferences about why firms adopt LPGs given the unique perspective our data afford. In particular, we have data on the number of restrictions contained in each guarantee and whether each firm's guarantee applies to its rivals' advertised prices only or also to their selling prices. Using this information, we can indirectly test whether LPGs are consistent with facilitating tacit collusion and whether some LPGs are less likely than others to be facilitating.

¹⁸ Note that the total number of firms (248) in the last column of Table 1 differs from the total number of firms in our sample (234) because some firms' LPGs differ by city and/or date.

¹⁹ One issue discussed in Michael R. Baye & Dan Kovenock, How to Sell a Pickup Truck: "Beat-or-Pay" Advertisements as Facilitating Devices, 12 Int'l J. Indus. Org. 21 (1994), is the extent to which LPGs are binding on firms and what the damages would be in the event of breach. Interestingly, we find 38 cases in which firms try to clarify this by including a penalty clause in their guarantee, for example, "We guarantee to beat any deal from any local competitor on the name brand or model that we sell or give you a \$100 reward!" All but one are PM.

A. *Restrictions on Low-Price Guarantees*

In this subsection, we will explore the possibility that the restrictions found in the fine print of LPGs help to mitigate a firm's risk. If risk is important, then we would expect the number of restrictions in each guarantee to vary according to the type of guarantee. In what follows we will focus on PM and PBA and report PB% and PB\$ only as part of the overall sample.

Having an LPG exposes a firm to risk. To see this, consider the following story, which appeared in the *London Times*.²⁰ Tesco, a supermarket chain in the United Kingdom, was selling a certain brand of sport socks at a package price of £8 and had a PBA guarantee of 200 percent. The owner of Essential Sports, a small sporting goods store, was unhappy with Tesco's price and decided to sell the same brand of sports socks at a package price of 10p. When consumers arrived at his store, the owner met them and suggested that they buy their socks instead at the local Tesco store, where they could obtain a matching price plus a refund of £7.9. For its entire inventory of sport socks that day, Tesco's incurred an out-of-pocket cost of -£7.8 per package.

Had Tesco adopted PM instead, its selling price would have been 10p. While still below the original list price of £8 (what Tesco thought it was going to get), it would have been less than the actual out-of-pocket cost that Tesco ended up paying. In general, a firm that adopts a PBA guarantee will face a greater degree of risk in the event of an unanticipated price cut by a rival than a firm that adopts PM. To see this, note that for two firms X and Y, if $P_y < P_x$, a unit decrease in P_y would cause firm X's selling price to fall by one if it has PM and by more than one if it has a PBA guarantee.

Tesco could also have mitigated its losses by adding fine print to its LPG. For example, it could have required that the products be identical (this might apply if there were differences in packaging), that the offer not be "one of a kind," and that the item be in stock. The latter restriction, in particular, could have been combined with a requirement that consumers bring written proof of the rival's lower price (if Tesco requires that the lower price be advertised in advance, then its employees can be on hand at the start of the day to buy out Essential Sport's entire stock, thus rendering the latter's guarantee invalid). Moreover, with sufficient foresight, Tesco could have prevented its losses by excluding Essential Sports and/or the offending sport socks from the list of competitors and products to which its LPG applied.

By its choice of guarantee and the restrictions it places on it, therefore, a firm can mitigate its losses in the event of an unanticipated price cut by rivals. If a PBA guarantee is associated with greater risk than PM, then, all else equal, we would expect the former to have a larger number of restrictions.

²⁰ Robin Young, Tesco Toes the Line in Sock Price War, *London Times*, February 3, 1998, at 5.

To test this conjecture, we formulate null hypothesis 1 and its one-sided alternative hypothesis 1a.

The Riskiness of PBA versus PM

HYPOTHESIS 1. PBA has the same or fewer restrictions than PM.

HYPOTHESIS 1a. PBA has more restrictions than PM.

To test this hypothesis, we have systematically gone through the fine print of all LPGs in our sample and identified nine types of restrictions, which we organize into three groups. The first group consists of restrictions that impose extra time costs on consumers.

1. The consumer must supply proof of a competitor's lower price in 30.1 percent (155/515) of the LPGs (for example, "bring us the ad" or "must supply written proof of a lower price").
2. Customers are instructed in 30.7 percent (158/515) of the LPGs to seek out particular employees in the store when requesting refunds (for example, a "customer services representative," the "service desk," a "manager," the "pharmacist," or "trained experts").

In the first case, the firm requires consumers to provide proof of a competitor's lower price before granting the refund. In the second case, a store employee verifies that the conditions of its LPG have been satisfied; for example, it might call the rival firm for a price quote. We find that 54.4 percent (280/515) of all LPGs have at least one of these two restrictions.

The next three restrictions are aimed at competitors, products, and/or geographical areas. We find that 65.2 percent (336/515) of all LPGs have at least one of these three restrictions.

3. Restrictions on which goods are covered by a firm's guarantee are mentioned in 49.3 percent (254/515) of the LPGs (for example, "turkeys" or "Michelin Tires"). Or, a firm might single out an item for exclusion from its LPG, for example, "cellular phones."
4. Restrictions on which competitors are covered by the firm's guarantee are mentioned in 40.8 percent (210/515) of the LPGs (for example, "authorized retail store only").
5. Restrictions on the geographical area to which a firm's guarantee applies are mentioned in 35.5 percent (183/515) of the LPGs (for example, "a 3-mile radius").

Restrictions 6–9 are of a more miscellaneous nature, with the store manager often being the arbiter. At least one of these restrictions occurs in 53.4 percent (275/515) of all guarantees.

6. The products have to be identical in 31.7 percent (163/515) of the LPGs.
7. The product has to be in the competitor's stock in 23.1 percent (119/515) of the LPGs.

TABLE 2
PERCENTAGE OF LOW-PRICE GUARANTEES, BY RESTRICTION NUMBER

	1	2	3	4	5	6	7	8	9	<i>N</i>
All LPGs	30.1	30.7	49.3	40.8	35.5	31.7	23.1	35.0	21.0	515
PM	22.2	23.7	36.9	33.5	19.7	23.7	17.8	23.7	18.5	325
PBΔ	43.6	46.0	74.2	57.7	70.6	49.1	35.6	60.1	25.2	163

NOTE.—LPG: low-price guarantee; PM: price-matching guarantee; PBΔ: a guarantee to beat a competitor's lower price by λ% of the price difference.

8. Exceptions such as “floor samples,” “bonus offers,” “one-of-a-kind offers,” and “special rebate offers” are made explicit in 35 percent (180/515) of the LPGs.
9. The firm absolves itself of any errors in its ads in 21.0 percent (108/515) of the LPGs.

Table 2 gives the percentage occurrence of each restriction for the sample of all guarantees, the sample with just PM, and the sample with just PBΔ. For example, we see from Table 2 that restriction 1 (consumer must supply proof of a lower price) occurs in 30.1 percent of all guarantees: 22.2 percent of PM and 43.6 percent of PBΔ. The three most common restrictions are the limitations on which goods are covered by a firm's guarantee (restriction 3), limitations on which competitors are covered (restriction 4), and limitations on the geographical areas to which the guarantee applies (restriction 5), which occur in 49.3 percent, 40.8 percent, and 35.5 percent of all LPGs, respectively.

As one can see, the PBΔ percentages are higher than the PM percentages in all nine restrictions. In many cases, they are more than twice as large as the PM percentages. In fact, aside from restriction 9, the least common restriction among PBΔ guarantees occurs almost with the same frequency as the most common restriction among PM guarantees (35.6 percent versus 36.9 percent, respectively).

More formally, hypothesis 1 can be tested with the one-sided *t*-test that compares the mean number of restrictions for PM and PBΔ guarantees. The mean number of restrictions over all LPGs in the sample is 2.971. The sample mean is lower for PM (2.197) and higher for PBΔ (4.620) guarantees, and the difference is significant at the 1 percent level according to the one-sided *t*-test ($t = 10.960$). Thus, we can reject null hypothesis 1 in favor of alternative hypothesis 1a.²¹

²¹ The reliability of the *t*-test may be compromised if the distribution for the number of restrictions is not normal or if the variance of the distribution is not the same for PM and PBΔ guarantees. To confirm that PBΔ guarantees do tend to have more restrictions than PM guarantees, we employ the Mann-Whitney nonparametric *U*-test, which does not rely on these assumptions. This test shows that the median number of restrictions is indeed higher for PBΔ than for PM guarantees ($z = 9.795$).

The notion that PBD guarantees are riskier than PM guarantees, and that firms may try to mitigate this extra risk by adding restrictions, is quite intuitive and supported in our data. This notion in itself may account for why nearly two-thirds of all LPGs promise to match rather than beat competitor prices. Given the differences in risk, the only reason for a firm to adopt a PBD guarantee over a PM guarantee would be if it were more effective than PM in achieving its intended purpose. In other words, if PBD offered no advantage, then we would expect firms to have a preference for PM guarantees. This suggests that either PBD does offer some advantages over PM when used for the same purpose or that the two kinds of guarantees are being used for different purposes.

B. *Advertised versus Selling Prices*

Economic theory suggests that one can infer something about why an LPG is adopted simply by knowing whether it applies to advertised prices only or also to selling prices. Specifically, economic theory suggests that if an LPG applies to a rival's advertised prices only, then it is inconsistent with facilitating tacit collusion. In this subsection, we consider whether PM and PB guarantees differ in their propensity to apply to a rival's advertised prices.

The issues are best framed in the context of Newmark & Lewis's rivalry with Crazy Eddie, as reported in Avinash Dixit and Barry Nalebuff's book *Thinking Strategically*.²² In their book, Crazy Eddie is contemplating a price cut despite Newmark & Lewis having an LPG that reads, "If after your purchase, you find the same model advertised or available for sale for less . . . we, Newmark & Lewis, will gladly refund (by check) 100 percent of the difference, plus an additional 25 percent of the difference." Dixit and Nalebuff ask whether Crazy Eddie's price cut might be profitable and note that if Crazy Eddie were to lower its price, consumers would simply buy from Newmark & Lewis at the higher price and claim their refund worth 125 percent of the difference. Hence, they conclude that "Crazy Eddie is worse off than where he started. So why bother?" Crazy Eddie would be worse off because its price cut would fail to increase sales and its profit margin would be lower.

However, as Edlin and Kaplan point out, Dixit and Nalebuff's reasoning implicitly assumes that Newmark & Lewis's LPG applies to Crazy Eddie's actual selling price, not just its advertised price.²³ Otherwise, if Newmark & Lewis's LPG applies only to Crazy Eddie's advertised price, then, instead of undercutting, Crazy Eddie can profitably "overcut" (adopt his own PBD guarantee and raise his advertised price). With a strategy of overcutting, it is Newmark & Lewis who face the loss of their customers since, in doing

²² See Dixit & Nalebuff, *supra* note 8.

²³ See Edlin, *supra* note 3; and Kaplan, *supra* note 6.

so, Crazy Eddie has effectively lowered his selling price while ensuring that Newmark & Lewis's LPG is not invoked.²⁴

Thus, economic theory suggests that tacit collusion cannot be supported if LPGs apply to advertised prices only but can be supported if LPGs apply to selling prices. Economic theory does not, however, require that firms adopt the PBA guarantee. Indeed, we could replace Newmark & Lewis's PB guarantee with a PM promise and much the same story would hold. Economic theory is silent on the topic of which type of guarantee is best because the literature tends to posit static models of equilibrium in which no firm is ever "surprised." In this world, both types of guarantees are equally effective at facilitating high prices, and there are no grounds to choose one over the other. However, in the real world one could make an argument in both directions. On the one hand, one might expect firms to have some preference for PM guarantees over PB guarantees when the purpose is to facilitate tacit collusion given that PB guarantees tend to be associated with greater risk. On the other hand, one might expect some firms to prefer PB guarantees over PM guarantees given that the former are able to deliver more severe punishment if a rival were to follow through on a threat to cut prices.

If PM guarantees are more effective than PB guarantees at facilitating tacit collusion, all else equal, then we would expect PB guarantees to apply relatively more often to a rival's advertised prices only. To test this conjecture, we formulate null hypothesis 2 and its one-sided alternative 2a.

The Preference between PBA and PM

HYPOTHESIS 2. PBA is equally or less likely to be based on advertised prices than PM.

HYPOTHESIS 2a. PBA is more likely to be based on advertised prices than PM.

To test this hypothesis, we have systematically gone through all LPGs in our sample and classified them as either applying to advertised prices only or not. An example of the former is the advertisement from Just Tires: "Find a lower *advertised* price in your local newspaper on any tires you purchased from us within 30 days of purchase, and we'll refund 125 percent of the difference."²⁵ In this case, the advertisement explicitly states that the guarantee only applies to advertised prices. In contrast, an example of a guarantee

²⁴ To see why overcutting does not work if Newmark & Lewis's LPG applies to selling prices, suppose Newmark & Lewis advertises a price of \$100 and Crazy Eddie attempts to undercut by advertising a price of \$120 and adopting a PBA guarantee of 125 percent. Then, initially Crazy Eddie's selling price drops to \$95. However, this now activates Newmark & Lewis's guarantee, causing its selling price to drop from \$100 to \$93.75, which in turn causes Crazy Eddie's selling price to fall to \$93.44, and so on, until a common final selling price of \$93.33 is reached. In this case, Crazy Eddie would have failed in his attempt to obtain a lower selling price, and overcutting would be unprofitable.

²⁵ Just Tires advertisement, Baltimore Sun, September 29, 1996.

TABLE 3
ADVERTISED VERSUS SELLING PRICES AND THE NUMBER OF RESTRICTIONS

	Advertised Prices	Selling Prices	Total
All LPGs:			
Mean	3.827	2.332	2.971
SD	2.375	2.464	2.535
N	220	295	515
PM:			
Mean	3.328	1.569	2.197
SD	2.291	2.134	2.345
N	116	209	325
PBΔ:			
Mean	4.521	4.754	4.620
SD	2.386	1.973	2.217
N	94	69	163

NOTE.—LPG: low-price guarantee; PM: price-matching guarantee; PBΔ: a guarantee to beat a competitor's lower price by λ% of the price difference. SD: standard deviation.

that applies to selling prices is Tires Plus's advertisement in the *Baltimore Sun*: "150 percent Best Price Guarantee—We'll Meet or Beat any Tire Price."²⁶ In this case, Tires Plus's guarantee is not restricted to advertised prices only.

In the majority of cases (327/515) we can classify LPGs as applying to either advertised or selling prices. However, many of the LPGs in our sample (188/515) are ambiguously worded (for example, "We guarantee to have the lowest prices in town"). In these instances we lump them together with the guarantees that are not restricted to advertised prices only, thus overestimating the number of guarantees that actually apply to selling prices.²⁷

Table 3 presents the breakdown of each type.²⁸ We see that of the 515 LPGs, 43 percent (220/515) apply to advertised prices. The percentage is lower for PM and higher for PBΔ guarantees: of the 325 PM guarantees, 36 percent (116/325) apply to advertised prices, and of the 163 PB guarantees, 56 percent (94/163) apply to advertised prices. These numbers are difficult to reconcile with a belief that LPGs are used solely (or even primarily) for the purpose of facilitating tacit collusion.

To check whether PM and PBΔ guarantees apply equally to advertised prices, we employ the χ^2 test of independence between these two LPG characteristics. The χ^2 test determines whether there is an association between the type of LPG (PM or PBΔ) and whether it applies to advertised or selling prices. We find that the occurrences are not independent ($\chi^2(1) = 21.387$

²⁶ Tires Plus advertisement, Minneapolis Star Trib., November 24, 1996.

²⁷ In the Appendix, we take the opposite approach and lump the ambiguously worded LPGs together with the guarantees that are restricted to advertised prices. We show that our qualitative conclusions are unchanged.

²⁸ See also the analogous table (Table A1) in the Appendix.

and a p -value of less than 1 percent imply that the association is highly significant). Thus, we can reject null hypothesis 2 in favor of the one-sided alternative hypothesis 2a. This means that PB guarantees have a higher propensity to apply to advertised prices and thus that they are more likely to be inconsistent with firms using them to facilitate high prices.

C. Hassle Costs versus Risk

Economic theory suggests that hassle costs, which tend to increase with the number of restrictions in a firm's guarantee (since PBD guarantees have more restrictions than PM guarantees, we would expect PBD guarantees to be associated with higher hassle costs than PM guarantees, all else being equal), limit the ability of firms to raise prices. From a consumer's perspective, requesting a refund is a cost-benefit calculation. The expected benefit is equal to the promised refund when all restrictions are satisfied times the likelihood of obtaining it—which is decreasing in the number of restrictions. Restrictions on the competitors, products, and geographical areas to which a firm's LPG applies, and requirements that the products be identical and in the competitor's stock, for example, all decrease the likelihood that a refund request will be granted and thus reduce a consumer's expected benefit. The expected cost is also increasing in the number of restrictions. Having to supply written proof of a competitor's lower price imposes costs on consumers that are similar to those imposed on consumers when they use coupons, and requiring consumers to seek out a store manager instead of allowing consumers to request refunds at the checkout counter lengthens the time consumers can expect to spend at the store.

In short, although restrictions in a firm's LPG help to mitigate risk, they also increase consumers' hassle costs and make it less likely that they will request refunds. And, as Hviid and Shaffer have shown,²⁹ if consumers are reluctant to request refunds, then the ability of LPGs to support high prices is undermined.³⁰ From the firms' perspective, therefore, the optimal number of restrictions depends on a careful balancing of opposing interests.

We conjecture that where this line is drawn may allow inferences about a guarantee's intended purpose. For a given level of risk, we would expect LPGs adopted to facilitate high prices to have fewer restrictions than LPGs adopted for some other purpose, all else equal.³¹ Thus, if one believes that

²⁹ See Hviid & Shaffer, *supra* note 6.

³⁰ To see this, suppose one firm advertises a price of \$100 and another firm—selling an identical product—advertises a price of \$99.99. Unless consumers are willing to buy from the higher priced firm and incur hassle costs in requesting their 1-penny refund (that is, unless hassle costs happen to be less than 1 penny), the price cut will be profitable.

³¹ For example, suppose firms wish to price discriminate among consumers. Having some threshold of hassle costs may be needed to induce self-selection, so that only the more price-sensitive consumers request refunds. Such costs might include supplying written proof of a competitor's lower price and having to seek out a store manager.

LPGs that apply to selling prices are adopted to facilitate tacit collusion and LPGs that apply to advertised prices are not, then we would expect the former to be associated with fewer restrictions than the latter (despite the fact that LPGs that apply to selling prices are likely to be riskier than LPGs that apply to advertised prices, holding constant the type of guarantee—PM or PBA). Conversely, if risk considerations dominate, then we would expect the opposite to be true. We can now state the null hypothesis and its two-sided and one-sided alternatives.

Hassle Costs versus Risk

HYPOTHESIS 3. Relative to LPGs of the same type that apply to advertised prices, LPGs that apply to selling prices have the same number of restrictions.

HYPOTHESIS 3a. Relative to LPGs of the same type that apply to advertised prices, LPGs that apply to selling prices have a different number of restrictions.

HYPOTHESIS 3b. Relative to LPGs of the same type that apply to advertised prices, LPGs that apply to selling prices have fewer restrictions.

We use *t*-tests to assess hypothesis 3 against its alternatives for all LPGs and for PM and PBA guarantees. Table 3 presents summary statistics for the number of restrictions across various types of LPGs. The findings are striking. The mean number of restrictions over all LPGs is 3.827 when the guarantee applies to advertised prices and 2.332 when it applies to selling prices. The mean number of restrictions for the sample of PM guarantees is 3.328 when the guarantee applies to advertised prices and 1.569 when it applies to selling prices. The *t*-tests confirm that these are significant differences ($t = 6.916$ and $t = 6.930$, respectively), which allows us to reject null hypothesis 3 in favor of the one-sided alternative hypothesis 3b at any conventional level of significance. In contrast, the mean number of restrictions for the sample of PBA guarantees is 4.521 when the guarantee applies to advertised prices and 4.754 when it applies to selling prices. The two-sided *t*-test shows that this difference is not significant at the 10 percent level ($t = .660$). Hence, we cannot reject null hypothesis 3 in favor of the two-sided alternative hypothesis 3a for PBA guarantees. The nonparametric Mann-Whitney *U*-test that compares the median number of restrictions for various types of LPGs leads to the same conclusions.

Relative to PBA guarantees, we see that PM guarantees tend to have fewer restrictions (2.197 versus 4.620) and apply disproportionately more to selling prices (64 percent versus 44 percent). We also see that PM guarantees tend to have fewer restrictions when they apply to selling prices than when they apply to advertised prices. These results suggest that PM guarantees are more likely to be conducive to facilitating high prices than PB guarantees, and they are consistent with what we would expect if the PM guarantees that apply to selling prices were adopted to facilitate tacit collusion. On the other

TABLE 4
INCIDENCE OF FACILITATION

	Facilitate	Not Facilitate	Total
All LPGs	212	303	515
PM	182	143	325
PBΔ	16	147	163

NOTE.—LPG: low-price guarantee; PM: price-matching guarantee; PBΔ: a guarantee to beat a competitor's lower price by $\lambda\%$ of the price difference.

hand, we see that PB guarantees tend to have more restrictions (4.620 versus 2.197) and apply disproportionately more to advertised prices (56 percent versus 36 percent). We also see that PBΔ tend to have the same number of restrictions associated with them when they apply to selling prices than when they apply to advertised prices. These results suggest that PB guarantees are less likely to be conducive to facilitating high prices than PM guarantees, and they are not consistent with what we would expect if the PB guarantees that apply to selling prices were adopted to facilitate tacit collusion. Our results suggest that the majority of PB guarantees have features that are inconsistent with their use as a facilitating device, and thus it is likely that the majority of them are adopted for reasons other than price facilitation. Our results also suggest that PB and PM guarantees differ significantly in their features.

D. Consistency with Tacit Collusion

The differences between PM and PB guarantees become even more striking if we move away from the aggregate statistics of Table 3 and instead classify each individual LPG according to whether it applies to selling prices and has few restrictions (hassle costs). As we have seen, theory that is based on the work of Edlin, Hviid and Shaffer, and Kaplan suggests that for LPGs to facilitate prices, they should apply to selling prices and have low hassle costs.³² In what follows, we define a dummy variable Facilitate that equals one when the necessary condition is met for an LPG and zero otherwise. We operationalize this by equating low hassle costs with three or fewer restrictions (the average number across all LPGs is 2.971).

Table 4 shows the incidence of facilitation for PM and PB guarantees.³³ We see that of PM guarantees, 56 percent (182/325) are consistent with facilitation, of PBΔ guarantees, only 9.8 percent (16/163) are consistent with facilitation, and of all LPGs, only 41.2 percent (212/515) are consistent with facilitation. The difference in the incidence of facilitation for PM and PB guarantees is significant at the 1 percent level, according to the one-sided χ^2

³² See Edlin, *supra* note 3; Hviid & Shaffer, *supra* note 6; and Kaplan, *supra* note 6.

³³ See also the analogous table (Table A2) in the Appendix.

TABLE 5
POSTSALE SEARCH AND TYPE OF GUARANTEE

	30+ Days	1-14 Days	No Search	Total
All LPGs	171	50	294	515
PM	50	22	253	325
PBΔ	119	28	16	163

NOTE.—LPG: low-price guarantee; PM: price-matching guarantee; PBΔ: a guarantee to beat a competitor's lower price by λ% of the price difference.

test for independence ($\chi^2(1) = 96.031$). This finding confirms that PB guarantees are much less likely to be consistent with facilitating tacit collusion than PM guarantees. In all, over half the LPGs (303/515) are inconsistent with facilitating high prices.

V. OTHER MOTIVES FOR LOW-PRICE GUARANTEES

We have shown that fewer than half of the LPGs in our sample are consistent with the dominant view of these guarantees as expressed in the literature. In addition, we have shown that PB guarantees tend to have features that are significantly different from PM guarantees. In this section, we document yet another significant difference between PM and PB guarantees and, in the process, conjecture alternative motives for their use.

In addition to classifying LPGs as PM or PB, we can also classify them by whether or not they allow consumers to search for lower prices postsale. We find that 57 percent (294/515) of all LPGs do not allow postsale search. In these cases, the firm's LPG ends at the point of purchase. In other words, it becomes void once the consumer buys the product. In the remaining 43 percent (221/515) of cases, however, a firm will promise to honor its LPG for a period of time even after a sale is made if the consumer subsequently finds a lower price. Sometimes the lower price must be found elsewhere. Other times, the lower price can be from the same firm (this would be the case, for example, if a most-favored-customer (MFC) clause were included). The typical time allowed for search ranges from 2 days to the lifetime of the product, with 30 days (158 LPGs) and 7 days (38 LPGs) being the most popular. These two search times account for 89 percent (196/221) of all LPGs with postsale search.

Table 5, which looks at postsale search by type of LPG, shows a striking result. More than 90 percent (147/163) of PBΔ guarantees allow postsale search, but only 22 percent (72/325) of PM guarantees have this feature. Of the LPGs that allow search for 30 or more days, 70 percent (119/171) are PBΔ; of the LPGs that allow search for less than 30 days, 56 percent (28/50) are PBΔ; and of the LPGs that do not allow search, only 5 percent (16/294) are PBΔ.

TABLE 6
 MOST-FAVORED-CUSTOMER (MFC) CLAUSES
 AND SEARCH OPTIONS

	MFC	No MFC	Total
30+ days	99	72	171
1–14 days	5	45	50
No search	0	294	294
Total	104	411	515

These differences among LPGs and why some allow search for less than 2 weeks while others give more than a month are unexplored areas for future research. They seem sufficiently important, however, that we offer here an educated guess. We conjecture that firms may allow postsale search in order to induce consumers to adopt a “buy now rather than wait” philosophy and that one factor in determining the length of search to allow is how often products typically go on sale (marked down). Suppose the firm is mostly concerned with inducing consumers to buy from it before they would otherwise be finished comparison shopping. Offering postsale search may help, but there is no need to offer a long search time or to include one’s own future prices in one’s guarantee. Alternatively, if the firm is mostly concerned with inducing consumers not to wait for a future sale, then having a guarantee that allows postsale search may also be an effective selling strategy, but, relative to the former case, we would expect the LPG to be associated with a longer period of postsale search³⁴ and to include in the guarantee the firm’s own future prices, as in Circuit City’s LPG: “We’ll beat any legitimate price from a local store stocking the same new item in a factory-sealed box. Even after your purchase, if you find a lower price within 30 days, including our own sale prices, we’ll refund 110 percent of the difference.”

This suggests that LPGs that allow longer search times should also include their own future prices (MFCs).³⁵ Table 6 provides confirming evidence.

Of the 104 LPGs that have an MFC, 95 percent (99/104) allow postsale search of 30 days or more. And of the 221 LPGs that allow consumers to search for lower prices postsale, guarantees that allow consumers to search for 30 or more days are almost six times as likely to have an MFC than guarantees that have a shorter search time (99/171 versus 5/50).

To show that there exists a significant association between the two char-

³⁴ Allowing consumers up to 14 days to search may be adequate in the former case, whereas 14 days might not be adequate if consumers anticipate that a product is likely to go on sale but are uncertain as to when.

³⁵ For a discussion of most-favored-nation clauses as an efficiency provision in long-term contracts, see Keith J. Crocker & Thomas P. Lyon, What Do “Facilitating Practices” Facilitate? An Empirical Investigation of Most-Favored-Nation Clauses in Natural Gas Contracts, 37 J. Law & Econ. 297 (1994).

acteristics of LPGs, we perform the χ^2 test for independence between the occurrences of MFC and search option (no search, 1–14 days, and 30+ days). These features of LPGs are clearly not independent since $\chi^2(2) = 228.429$ is well above the critical level.

VI. CONCLUSIONS

We set out in this paper to document the incidence and variety of LPGs and their features, using a unique data set obtained from newspaper ads. In all, we have a total of 515 LPGs. From our data set it is evident that the use of LPGs is widespread, with no obvious missing retail sectors. Moreover, we observe a variety of guarantees within and across sectors and across time and geographical space. We find that firms promise to match prices in over 63 percent of LPGs. Among PB guarantees, the most popular refund a percentage of the difference in price if consumers find a lower price elsewhere.

The dominant view in the economics literature is that LPGs facilitate tacit collusion. This literature also finds, however, that the LPGs that are adopted for this purpose should apply to rivals' selling prices and have low hassle costs. We do not find that this is the case for the majority of LPGs. Instead, we find that 44 percent of PM guarantees and more than 90 percent of PB guarantees are inconsistent with their use as facilitating devices. Of the LPGs that are consistent with this motive, we find that PM guarantees are more likely than PB guarantees to be conducive to facilitating high prices.

Our results suggest that firms adopt LPGs for a variety of reasons and that the reasons may differ for PB and PM guarantees. We find that PB guarantees have significantly more restrictions associated with them (higher hassle costs) than PM guarantees, are less likely to apply to selling prices, and are more likely to allow consumers to search after purchase. In fact, whereas postsale search is allowed in only 43 percent of all LPGs, more than 90 percent of PB guarantees have this feature.

It would thus appear from the data that the dynamics of consumer search and purchase behavior are very important in understanding the differences among LPGs. Yet virtually all theoretical models of LPGs to date are static, one-shot games. Clearly, from our data, the theoretical challenge is to explain why such a large (small) proportion of PB (PM) guarantees allow postsale search. There is also a clear need for models that allow for MFCs as a part of the LPG itself. We conjecture that one reason why firms may allow postsale search is to induce consumers to buy now rather than (1) wait for a product to go on sale or (2) continue searching the competition for price quotes.

The data highlight the importance of hassle costs (as proxied by the number of restrictions in each LPG) and whether LPGs relate to advertised or selling prices. Since a firm can choose whether and how many restrictions to impose, and since it can choose whether to apply its LPG to advertised or selling prices, we think the firms choices of these variables should be modeled rather

than assumed. Economic theory suggests that one way to restore the power of LPGs to facilitate high prices is to keep hassle costs as low as possible and relate them to the actual selling price offered by the competitor rather than to its advertised price. Thus, for the tacit-collusion story to be convincing as the dominant explanation for LPGs, one must show that a substantial number of LPGs have few restrictions and apply to selling prices rather than advertised prices. The evidence does not provide support for this.

APPENDIX A

This Appendix demonstrates that our qualitative results hold true when we utilize an alternative treatment of ambiguously worded LPGs, lumping them together with LPGs that apply to advertised prices. Tables A1 and A2 correspond to Tables 3 and 4 in the main text.

Table A1 classifies PM or PBA guarantees according to whether they apply to advertised or selling prices. It also gives summary statistics on the number of restrictions in each type of LPG.

The χ^2 test of independence between the LPG (PM or PBA) and whether it applies to advertised or selling prices allows us to reject null hypothesis 2 in favor of the one-sided alternative hypothesis 2a at the 5 percent significance level ($\chi^2(1) = 5.53$; p -value = .019).

Turning to the summary statistics on restrictions, we see that the mean number for the sample of all LPGs is 3.149 when the guarantee applies to advertised prices and 1.569 when it applies to selling prices. The mean number of restrictions for the sample of PM guarantees is 2.368 when the guarantee applies to advertised prices and .975 when it applies to selling prices. One-sided t -tests confirm that the observed differences in the number of restrictions when the LPG applies to advertised prices and when it applies to selling prices are significant at the 1 percent level for all LPGs and for PM guarantees ($t = 4.557$ and $t = 3.583$, respectively). In both cases, null hypothesis 3 can be rejected in favor of the one-sided alternative hypothesis 3b at the 1 percent level. The mean number of restrictions for the sample of PBA guarantees is 4.643 when the guarantee applies to advertised prices and 4.222 when it applies to selling prices. The two-sided t -test shows that this difference is not significant at the 10 percent level ($t = .552$). Hence, we cannot reject null hypothesis 3 in favor of the two-sided alternative hypothesis 3a for PBA.

Table A2 shows the incidence of facilitation for PM and PB guarantees. We see that for PM guarantees, 12 percent (39/325) are consistent with facilitation; for PBA guarantees, only 1.8 percent (3/163) are consistent with facilitation; and for all LPGs, only 9.7 percent (50/515) are consistent with facilitation. The difference in the incidence of facilitation for PM and PB guarantees is significant at the 1 percent level, according to the one-sided χ^2 test for independence ($\chi^2(1) = 14.245$). This finding suggests that PM guarantees are much more likely to be consistent with facilitating tacit collusion than PB guarantees.

TABLE A1
ADVERTISED VERSUS SELLING PRICES AND THE NUMBER OF RESTRICTIONS

	Advertised Prices	Selling Prices	Total
All LPGs:			
Mean	3.149	1.569	2.971
SD	2.564	1.758	2.535
N	457	58	515
PM:			
Mean	2.368	.975	2.197
SD	2.424	1.074	2.345
N	285	40	325
PBΔ:			
Mean	4.643	4.222	4.620
SD	2.228	2.108	2.217
N	154	9	163

NOTE.—LPG: low-price guarantee; PM: price-matching guarantee; PBΔ: a guarantee to beat a competitor's lower price by $\lambda\%$ of the price difference.

TABLE A2
INCIDENCE OF FACILITATION

	Facilitate	Not Facilitate	Total
All LPGs	50	465	515
PM	39	286	325
PBΔ	3	160	163

NOTE.—LPG: low-price guarantee; PM: price-matching guarantee; PBΔ: a guarantee to beat a competitor's lower price by $\lambda\%$ of the price difference.

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