

CBA · NAU
College of Business
Administration
Northern Arizona
University
Box 15066
Flagstaff AZ 86011

Gasoline Zone Pricing: Good Management or a Politician's Opportunity for Good Press?

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Dean Howard Smith*

Associate Professor of Economics and Applied Indigenous Studies
College of Business Administration
Northern Arizona University
PO Box 15066
Flagstaff, AZ 86011
Tel: (520) 523-7396
Fax: (520) 523-7331
Email: Dean.Smith@nau.edu

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INTRODUCTION

The first months of the new millennium presented some very interesting movements in the prices of crude oil and its by-products. Starting at historically low prices, the price movements stimulated discussions at several levels. International negotiations between oil consuming nations and oil producing nations took place at the highest levels of government. Protesting convoys of truck drivers arrived in Washington and almost caused Great Britain's transportation infrastructure to halt. Hearings were held in Washington and several state legislatures. And caught in the middle of this seeming disaster were the gasoline refiners and the practice of zone pricing.

Zone pricing is simply defined as charging different prices to customers based on their geographic location. Gasoline refiners utilize this practice to segment different markets for their products. Using classic price discrimination strategies, these wholesalers of gasoline segment the market in order to increase their profits. Make no mistake that is the reason.

But at several levels, these companies are being charged with heinous ill deeds. These companies are seemingly gouging their direct customers, also known as dealers, and the public who buy the final gasoline product. The evil companies are doing this to the detriment of the public, the environment and even free enterprise.

That is the rhetoric, but what is the reality? This paper explains why the practice of zone pricing is to the benefit of the public. Both simple and complex economic analyses explain why any regulations limiting a firm's capability to determine the price in a market is detrimental to all markets.

The economic and legal systems, and indeed much of the culture, of the United States are based on allowing firms to earn the maximum profit within the regulations stipulated. The political process is supposed to stipulate regulations when they are necessary, but in this case the rhetoric truly fogs the issues.¹

From finance theory, the management of a firm is charged with maximizing the wealth of its stockholders. Management's responsibility is to follow practices and strategies that provide the best return on the stockholders' investment. As such, if gasoline producers, or producers of any product for that matter, fail to employ price discrimination in response to competitive and local demand differences, then they are at odds with their job function. As discussed below, there may be times when a firm does not strictly follow profit maximizing behavior as a strategy to dissuade expensive litigation – even though they are within the spirit and letter of the law. In this case, we might coin the term “litigation prevention price” as opposed to profit maximizing price.

PRICE DISCRIMINATION: A PRIMER

“Price discrimination” is at once an unfortunate nomenclature and a very powerful pricing tool.² Dating back to Pigou (1920) and then Robinson's (1933) eloquent demonstration, price discrimination has been a favorite topic of economists and their students. Typically introduced at the Principles level, the analysis can be both simple and complex depending on the market structure under consideration. This section presents an elementary introduction to the idea. A later section adds complexity more relevant to the retail gasoline markets.

¹ See Smith (2000) for a discussion of the regulatory aspects of government in a liberal democracy.

² Readers familiar with the basics of price discrimination can easily skip this section with little loss of continuity.

Perhaps a less connotative term for price discrimination would be “differential pricing.” The term “discrimination” has several negative connotations due to civil rights discussions in the political and social arena totally unrelated to pricing behavior. The simplest definition, but one needing refinement below, is that a firm engages in price discrimination when it charges different prices to two or more customers. Stigler (1966, page 209) actually indicated that discriminatory pricing is an uncommon occurrence, which will be shown to be an invalid assertion. He defines the event of a firm charging different price to marginal cost ratios as evidence of discriminatory pricing. This definition allows for cost differences between servicing customers based upon a variety of factors such as set-up costs, quantity differences and the like.

In the most elementary presentation of price discrimination, the firm’s total output remains unchanged as it shifts from a single uniform price to two or more distinct prices. The resulting costs are therefore the same, but the revenues increase and therefore, the practice increases the firm’s profit. However, the simplest presentation assumes that the total market is fixed. It can be easily shown that price discrimination allows a firm to service submarkets not served under a uniform pricing strategy. This extension becomes vitally important when addressing zone pricing issues in retail gasoline markets.

Stigler’s definition of differing price to marginal cost ratios works well in a simple model. However, when the model is extended to include additional characteristics of reality a more refined description and understanding of price discrimination is required.

PRICE REGULATIONS: HISTORY AND DISCUSSION

United States policy regarding discriminatory pricing dates to 1887 and the Interstate Commerce Act regulations on railroads.³ The Clayton Act of 1914 extended the definitions and regulations of the practice. Most importantly, prohibitions on price discrimination were limited to cases where the effects of the practice “may be to substantially lessen competition or tend to create a monopoly.”

The Robinson-Patman Act amended the Clayton Act in 1936. Once again, prohibitions were limited to cases where competition was lessened or to create a monopoly. Thus, the prohibitions on price discrimination are clearly aimed at situations where firms are attempting to reduce competition by driving competitors out of business.

The laws are not designed to prohibit firms responding to local competition; indeed this concept was unrecognized at the time. As Pepall, Richards and Norman point out:

It’s important to keep in mind that the time of the FTC report (in 1934 leading to Robinson-Patman in 1936) was one of unprecedented economic upheaval and great economic insecurity for much of the population. Such an atmosphere naturally generated a search for scapegoats, and those firms or individuals who seemed to be somehow prospering were natural targets in this regard. (Pepall, Richards and Norman, 1999, page 145)

It is also important to recognize the development of economic theory at the same time. The eminent British economist Joan Robinson’s work on imperfect competition was simply too recent to have any impact on the legislative theory of Robinson-Patman.⁴ The theoretical basis for the legislation was essentially limited to the perfect competition model of Marshall.

Given the political worries of the day, the unfortunate terminology and the nascent level of economic theory, it is understandable that price discrimination was viewed as evil.

To this day, many Principles of Economics books go through a presentation showing the supposed evils of monopoly versus competition. Certainly, this was as far reaching as the general knowledge of economic theory pervaded in the early ‘30’s. Since monopoly power is a requisite for price discrimination, the practice was frowned upon given the economic, social and political environments of the day.

As M.L. Greenhut *et al.* conclude (1987, page 151):

Certainly, the simple (spaceless) foundations on which current policies with respect to price discrimination, dumping and so forth, are based need to be reexamined. It would appear, however, that such examination must be based on empirical analysis that takes full account of the interconnections between producers, the extent to which they produce differentiated or substitute commodities, and the locational choice they have made.

³ This section is based on Pepall, Richards and Norman (1999, pages 144-147). Scherer and Ross (1990, pages 508-516) also provide a more detailed background.

⁴ The two Robinsons were unrelated.

Although M.L. Greenhut *et al.* called for empirical analysis, a much more sophisticated theoretical series of analyses has been developed since these regulations were passed. This new and more robust body of knowledge allows for a much deeper appreciation of price discrimination as a tool for social and economic growth.

PRICE DISCRIMINATION: ADDING COMPLEXITY

Phlips (1983) advanced the discussion and understanding of discriminatory pricing strategies by initially indicating that a strict definition is difficult. After an extended discussion he ends up suggesting that when the same seller sells to buyers at different *net* prices, then price discrimination has occurred (page 6). This conceptual definition will be used herein henceforth.

Debreu (1959) argued that economic objects differ based on location in time, space and physical characteristics. “As soon as one of these factors changes, a *different* commodity results” (page 30). Utilizing a spatial economics framework, M.L. Greenhut *et al.* (1987, page 3) explain the multidimensionality of the pricing spectrum:

When we talk of the consumer’s location in a spatial sense, we can equally talk of the country in which the consumer is located, the time of day, month or year at which the consumer would prefer to purchase the commodity, or the consumer’s most preferred product variety in the sense of Lancaster (1979). When we refer to the producer’s location, we can equally consider the country in which the product is produced, the time of day, month or year at which it is produced, or the product variety actually manufactured by the producer. In place of transport costs, we can substitute tariff barriers, waiting time or storage time, or the utility lost consequent upon the consumer being offered a product other than the most preferred product.

So, when Phlips defines price discrimination as involving different net prices, he means based on the price paid by the consumer less any variation in transportation or similar costs. Phlips additionally states that:

...generally, discriminatory prices will be required for an optimal allocation of resources in real life situation. The reason for the difficulty into which uniform pricing is likely to fall is that real life firms do have at least *some* monopoly power and can use marketing techniques to keep their markets separate, so that price discrimination is generally possible. This fact of life is not well known, nor is it widely recognized that there exists a highly sophisticated and well-developed – though recent – body of literature indicating what should be done in such circumstances (page 1, emphasis in original).

Interestingly, Phlips is discussing the efficiency of resource allocation and not the profitability of firms. Recalling the monopoly versus competition argument, it is easily understood that high profits do not necessarily imply efficient use of resources. But when the economic problem is properly formulated via Debreu, M.L. Greenhut and others in an imperfect competition framework, resource allocation is improved by letting companies have the rein.

The sophisticated theoretical approaches to price discrimination utilize the aspects identified by Phlips of monopoly behavior governed by market forces. Indeed, M.L. Greenhut *et al.* paid homage to Robinson, by invoking her book title *Economics of Imperfect Competition*. As discussed above, regulations and legislation concerning the use of discriminatory pricing practices were all based on concern of competitive markets and the fear of monopoly power. However, the recent theoretical results more closely follow actual practices of firms by analyzing imperfect competition situations.

The economic theory of imperfect competition (the analysis of markets where firms have some monopoly power but are limited by competitors) is based on a single reality stemming from Debreu’s statement. Since each and every firm must have a unique location in space, time and product quality, firms are localized monopolies but must also react to each other with respect to differentiated and substitute commodities.

The concept of conjectural variations is used to explain these reactions of one firm to another. A whole variety of situations and circumstances have been modeled using real-world and theoretical frameworks. The resulting reaction functions explain the imperfect competition equilibria obtained under each scenario.

M.L. Greenhut *et al.* show that under certain market and demand conditions price discrimination not only increases profit, but also extends the market area served. The ability to lower prices at the market boundary below the reservation price (the highest price customers are willing to pay) allows firms to serve otherwise ignored market locations and increase total output over non-discriminatory pricing practices.

J. Greenhut, M.L. Greenhut and Smith (1991), and then J. Greenhut and Smith (1993) extend the work of the senior M.L. Greenhut by using a generalized model without limitations on cost or demand conditions. Non-discriminatory pricing and uniform pricing⁵ are the optimal pricing strategy only under very unique, even perverse, market conditions. The generalized demand characteristics of the J. Greenhut and Smith model allow for the incorporation of varying degrees of local competition and demographic changes. The generalized cost structure allows for variations in costs, such as land rent differentials for retail gas stations.

The generalized model allows for wide applications of imperfect competition and markets characteristics. Using the mathematical tools of Optimal Control Theory, the optimal pricing strategy is simply determined by deriving the delivered price schedule, what the customer pays, based on location and the mill price schedule, the net price received by the firm after subtracting transportation and other costs. Based upon local conditions at each point in the market area, the strategy is determined by the classic result of setting *localized* marginal revenue with *localized* marginal cost.

Optimal Control Theory was developed by Soviet mathematicians in the early 1960's to determine how to optimally control spacecraft. J. Greenhut and Smith use this method to show how the opportunity to vary prices and deliveries based on local conditions allows the firm to optimally control prices and sales to best serve the customers.

Recalling the space race development of Optimal Control Theory, consider the following discussion of a NASA Space Shuttle flight:

At about one minute into the flight, the vehicle goes through maximum dynamic pressure (Max Q), which simply means that if the wings of the shuttle are going to fall off, they will probably do so at this time. At Max Q, the atmosphere is still thick and resistant and the vehicle speed is still increasing. The main engines throttle back automatically to temporarily ease the load on the structure of the vehicle, then the engines smoothly run back up to full speed. (Linenger, 2000, 65-6.)

Imagine if NASA was limited to a fixed value for the control variable of throttle. The shuttle might very well either have its "wings fall off" or never achieve liftoff. This is the entire value of allowing and designing for control using Optimal Control Theory. Since the business of America is business, why should firms, the engine of society, be limited in their control options?

Although Stigler suggested that the practice was rarely used, the reality is that firms use price discrimination in a wide realm of situations. M.L. Greenhut (1981) found extensive evidence of spatial discrimination in Japan and Germany. Within the United States, price discrimination exists in numerous industries. Examples of these include the hotel, pharmaceutical, airline, internet, and health services industries.⁶

PRICE DISCRIMINATION: ADDING COMPLEXITY

A large body of economic literature and discussion has been devoted to comparing the so-called welfare results of different market structures. The most common method of analyzing market differences is to use "consumer surplus."⁷ Samuelson (1983, pages 195-202) argues quite clearly and forcefully that the typical analysis of consumer surplus is theoretically faulty at best.⁸

⁵ The pricing terminology employed herein is "non-discriminatory" means the firm charges the same net price to all customers. Thus the delivered price varies based on transportation and similar costs. "Uniform pricing" occurs when a firm charges the same delivered price to all customers. This is a specialized form of discrimination since all buyers face a different net price solely based on the amount of transportation costs. J. Greenhut and Smith show that neither of these extremes is likely to maximize profits.

⁶ See Smith (2001) for a detailed discussion of this point.

⁷ Supposedly, this is a measure to evaluate how much consumers benefit above the price paid for the product. For instance, if you would be willing to pay \$5 for an ice-cold beer on a hot afternoon on the golf course, but are only charged \$4, then you would be gaining a surplus of \$1. Consumer surplus is typically measured as the area under the demand function above the price. However, the typical derivation of demand functions is based on an "all or nothing" price instead of a pointwise stepping down the function one unit at a time. See Samuelson (1983, pages 195-202) for details. Willig (1975) argues that consumer surplus can be used to evaluate a variety of situations. Willig's oft invoked arguments are not nearly as strong as Samuelson's.

⁸ Perhaps the most often quoted piece regarding spatial pricing is by Holahan (1975).

As mentioned, the legislation and regulations concerning pricing behavior were developed based on a naïve understanding of economic behavior. Although there might be some intellectual benefit to comparing the efficacy of differing market types and structures, the analysis itself is actually very misleading.

Even if some theoretical validity could be purported using the idea of consumer surplus, the complexity of the question is deepened since different consumers are treated differently in a price discrimination regime. In the Robinson case of constant output, consumers with the less elastic demand pay a higher price and consumers with elastic demand pay the lower price. In this simplest case, the firm earns higher revenues, some customers pay a lower price and consume more of the product. These two facets of the market gain welfare. A segment of the market pays a higher price and consumes less of the product and is therefore worse off. As such there is no method available to determine if the welfare gain by the firm and some consumers is more or less than offset by the welfare loss by other consumers.

Extending the analysis from the simple Robinson case into the spatial arena further blurs the outcome of any welfare analysis. Price discrimination allows the firm to serve otherwise ignored market segments. This leads to an increase in total output in addition to higher profits with the same confusion concerning some people paying higher and others lower prices.

Recalling Philips' assertion that resource allocation is improved via discriminatory pricing, it is now important to include the idea of imperfect competition in the discussion. The theoretical concept of the "zero profit equilibrium" is a centerpiece of imperfect competition analysis.

When analyzing the behavior of a firm, economic profits are evaluated by taking into account the normal return to the firm for the investment and risk involved with the enterprise. As such, the zero profit equilibrium obtains when no firm has any incentive to leave the market and no further incentive exists for firms to enter the market. Positive economic profits attract firms to the business, and negative profits give firms an incentive to leave.

In the imperfectly competitive market, which is the real-world reality in most cases, competition occurs at the market boundaries between firms. The boundaries are defined by location, time or product quality. As long as a potential profit is available firms will enter the market and market output will increase.

If firms are prevented from selecting the optimal path of prices, then the total number of firms in the spatial landscape will be reduced, market output will be lessened, and some fringe market segments will remain unserved. Simultaneously, the opposite interpersonal transfers occur as some customers pay a higher price and consume less while others pay a lower price and consume more compared to the discriminatory situation.

Berman (1999, pages 45-46) argues that the economic system most likely to allow for growth and stability is a regulated market system. A basic premise of the regulated market structure is to allow firms to conduct business as they will unless such behavior causes harm to some sector of society.⁹ Certain market practices should be regulated when they cause harm, but these government interferences should be limited to cases where harm can be documented.

Although based on naïve economic theory, the Clayton and Robinson-Patman acts clearly limit prohibitions on pricing behavior when the behavior is specifically targeted at anti-competitive results. On its face, discriminatory behavior does not lead to anti-competitive actions.

M.L. Greenhut *et al.* (1987, pages 129-130) conclude:

In the long-run zero-profit equilibrium, the individual firm's market radii and outputs will be identical under f.o.b. mill and uniform pricing and will be greater than under discriminatory pricing. Total output will be greatest under discriminatory pricing, and the market will be served by a larger number of smaller firms than under f.o.b. mill or uniform pricing.

Generalizing local demands to account the prices of competitors' products, J. Greenhut, M.L. Greenhut and Smith (1991) and J. Greenhut and Smith (1993) show how discriminatory pricing may lead to multiple scenarios depending on the form of the localized demands. Following elementary economics, increased availability of substitute products from a firm's competitors leads to more elastic local demands and therefore lower prices. Undoubtedly, if the total market output increases through price discrimination, the *average* price paid by consumers must be falling, even if some end up pay higher prices.

Allowing firms to respond to competition via price discrimination leads to increased output and enlarged overall market coverage. Restricting this practice via legislation and regulation unnecessarily limits the potential of the market place and as Philips says, reduces the efficiency of resource allocation.

⁹ See Smith (2000)

UNDERSTANDING PRICING CHARACTERISTICS OF GASOLINE MARKETS

Gasoline wholesalers serve retail markets in a number of direct and indirect paths. Gasoline wholesalers may own the retail outlet, may sell to a leasee operator, may sell to a contract dealer, or sell to a jobber who then sells to the station operator. Additionally, the gasoline may be branded or unbranded. Branded gasoline must meet the specifications of a major company, BP for instance. Although beyond the scope of the current report, federal and state anti-trust regulations clearly limit the wholesaler from engaging in anti-competitive behavior based on the ownership relationship with the operator.¹⁰

Apart from the ownership relationships, gasoline markets vary in a number of market dimensions. Recalling Debreu's comment of differentiated products and the discussion of imperfect competition, each retail gas station must be treated as a separate market with various levels of local competition.

Cost differentials face gasoline wholesalers and retailers on several levels. Each of these facets has implications on the retail price and, working backwards, the wholesale price.

State and federal regulations mandate that certain localities sell specially formulated gasoline designed to reduce pollution. Since 1996, California has required a special formulation known as CARB. Prior to beginning production, it was estimated that the additional cost of producing CARB would be between 5 and 15 cents per gallon (cpg). However, the actual cost difference has been in the neighborhood of 4 cpg compared to conventional gasoline. (Leffler and Pulliam, 1999, page 7) More recently, reformulated gasoline (RFG) was introduced into the retail gasoline markets in Chicago and Milwaukee. The estimated cost differential is 25 cpg. (Slaughter, 2000, page 2) The cost differentials result in differing prices based on location. However, using Philips' definition of price discrimination, if the price differences perfectly match the cost differences, then price discrimination is not present.

Land and labor cost differentials can also lead to price differentials. Although one might think of a metropolitan region as being a single market, land prices clearly vary across the region. For example, the Phoenix metropolitan area includes the city of Scottsdale. Land prices in Scottsdale are substantially higher than in other areas of the metropolitan area. Similarly, labor costs can vary within a region and certainly between regions.

Gasoline wholesalers fully recognize these cost differences. If the wholesaler charges a uniform delivery price to the all retailers within a region, then pump prices will vary since some stations have to charge a higher market price. For example, Leffler and Pulliam (1999, Chart 13) show a retail margin of 5.6 cpg in California compared to 4.9 cpg in the rest of the U.S.. Alternatively, if pump prices are to be the same across the region, the wholesaler must charge different net prices to the retailer outlets to allow the retailers to recoup the cost differentials. As will be seen below, a middle ground is likely.

Transportation cost differences can explain some of the differences seen at the pump. Gasoline must be transported from the refineries via pipeline and truck to individual retail outlets. Rural locations may require additional transportation costs. On one level, Leffler and Pulliam include transportation costs into "Marketing Margin," but treat the entire state of California as a single market. On another level, they (page 12, fn 28) indicate a transportation cost of 2 cpg from Los Angeles to San Diego.

Regulatory differences also lead to cost differentials in terms of state and local taxes. The average of state and federal taxes on gas in California is 46.2 cpg. The average tax in the rest of the U.S. is 40.9 cpg. (Leffler and Pulliam, 1999, Chart 13)

Although Leffler and Pulliam (1999, Chart 13) ignore transportation cost differentials, they do itemize five categories that make up the price of gasoline: taxes (not including local taxes), retail margin, marketing margin, reformulation costs, and wholesale price. As Philips (1983) foresaw, defining price discrimination can be very difficult. In this case, what is the base or net price received by the refinery?

Not only do costs vary across the economic landscape, demands also vary across the landscape. As J. Greenhut and Smith (1993) have shown, differences in local demands can have a substantial impact on the optimal pricing strategy.

The base measurement influencing pricing behavior is the price elasticity. As discussed above, this measure shows the relative response of customers to price changes. The essentials of price discrimination are that customers with more elastic demand are charged a lower price and more inelastic demands result in a higher price. The remaining question is to determine why elasticities differ between gasoline markets.

Population demographics vary from location to location. Income differences and lifestyle habits have a great influence on customers' demands. For example, "Half the new vehicles sold are gas-guzzling vans and sport utility vehicles, and a decade of cheap gasoline has detracted from fuel-efficiency goals." (Satchell, 2000, page 40)

¹⁰ See Heide (1999) for details on laws governing relationships between franchisers and franchisees.

Families with higher incomes, where gasoline is a less substantial portion of total expenditures, typically purchase these vehicles. Once the vehicle is purchased, the demand for gasoline is determined as being relatively inelastic for those regular trips to schools, work, shopping and so on. Additionally, the families purchasing these vehicles typically cluster in certain neighborhoods. Thus the demand for gasoline at the neighborhood level is less elastic in some places than in others.

The number of local stations will also have an impact on the local demand. Umbeck and Barron (1999) found that San Diego had the lowest per square mile density of stations, with San Francisco next, and with Los Angeles having the highest density. Not surprisingly, the demand elasticity measures for these three regions were indirectly proportional to the station densities.

Recalling the importance of the zero profits equilibrium and the impact of local competition, there may very well be some cost differentials, such as land costs, that lead to lower station density in San Diego versus Los Angeles. The differentials may also occur due to population density and demographic differences, resulting in different demands. Combining the possible local cost and demand differences with transportation costs from Los Angeles, San Diego has room for fewer stations and therefore higher prices.

In addition, the so-called “border effect” causes more inelastic demands as customers fill up on their way into and again after returning from Mexico. This leads to higher prices in San Diego than in Los Angeles. This border-effect can be seen along both the Mexican and Canadian borders.¹¹

Other locational differences also explain varying elasticities. Consider the following extended intuited example. Flagstaff, Arizona usually has very high gasoline prices compared with other rural communities in Arizona and certainly higher than the metropolitan centers of Phoenix and Tucson. The transportation costs necessary to bring the product up the Mogollon Rim to Flagstaff’s elevation of 7,000 feet explains only part of the price differential.

Flagstaff has two distinct characteristics that result in relatively inelastic demand for gasoline. Flagstaff is the gateway to the Grand Canyon. Since people travel from all around the world to visit the Grand Canyon, a few extra cpg for the rental car is a minimal expense compared to several thousand dollars for travel, lodging and food.

Apart from the tourist trap¹² aspect of Flagstaff, the city is also on a major east-west route. Interstate 40 provides a relatively easy route from Los Angeles across the Rocky Mountains to the eastern portion of the country. Traveling east from Los Angeles, the route passes through Barstow, Needles,¹³ and Kingman. After Kingman, the highway passes through 180 miles of desert with very few places to buy gasoline. After passing through Flagstaff, the next large city is Gallup, New Mexico 180 miles further.

For many years, two signs on the highway clearly indicated the need to stop for gasoline. On the eastbound side, the sign read “Albuquerque 325 miles,” and on the westbound side it read “Los Angeles 485 miles.” Traveling in either direction, the long haul travelers have driven almost 180 miles without seeing a town of substantial size. These two road signs clearly indicated the need to stop for gas, food and possibly overnight lodging. The demand for gasoline, food and lodging suddenly becomes very inelastic. As such, the gasoline stations, and other service providers, recognize the possibility of raising prices.

Several issues come into play here. First, as the other towns¹⁴ along I-40 have grown by adding gas, food and lodging options, Flagstaff has lost much of its advantage. This clearly follows the introduction of competition as the market moves to a zero-profit equilibrium.

Second, several years ago, before the growth of Winslow and following a field research trip in eastern Arizona, the author stopped for gas and a restroom break. The customer in front of me bought \$1.50 worth of gas since the gas station did not take his credit card. The customer asked, “How far is it to Flagstaff and where can I use my XX card?” Realizing the purchase of \$1.50 of gas was totally inadequate to climb the mountain to Flagstaff, I gave the kid \$5. Although less so now with the explosion of the credit card market, brand name credit cards provide a source of monopoly power. However, in this case the provider didn’t have a local station.

Third, cross-country travelers can certainly overwhelm local demand characteristics. Gas stations located nearest the interstate highway system, or other major highways, typically charge higher prices than gas stations

¹¹ This information comes from conversations with and public presentations by Bruce Johnson and George Sietts of WSPA.

¹² Note the implication of the term “tourist trap” has on elasticity. Obviously, colloquial English identifies that the tourists have no other option.

¹³ Traveling east from Barstow and west from Needles, very large signs repeatedly warn that there are no services whatsoever for more than 100 miles across the Mohave Desert.

¹⁴ Traveling from Kingman to Gallup: Seligman, Ashfork, Williams, (Flagstaff), Winslow and Holbrook.

located only a ¼ mile down the road. In some cases this can result in a drastic price difference. For example, roughly one hour south of Flagstaff, on I-17, and an hour and a half north of Phoenix is the small town of Camp Verde. Three exits on I-17 service this community. The middle exit has several nationally recognized fast food and gasoline franchises. More importantly, this exit is easily seen from the highway since it is at the bottom of a valley. From either direction, and especially at night, it is very obvious that the middle exit has services available. Just north of the Middle Verde exit is another exit that is far less conspicuous from the highway. Signs are not easily seen from the highway and no fast-food restaurants are located at this exit. The price differential between gas stations *selling the same brand of gas* was 17 cpg on one recent trip. Clearly, 3-4 miles of transportation costs does not explain the price differential. Local residents avoid the tourist trap (again that term) while travelers unfamiliar with the local market stop and pay the higher gas price as they also grab a burger and fries at the more conspicuous exit.

M.L. Greenhut *et al.* indicated the need to reevaluate policies regarding pricing strategies with a proper understanding of spatial pricing and market structures. J. Greenhut and Smith joined the elder Greenhut in advancing the original model into a more generalized model and found myriad pricing possibilities. M.L. Greenhut *et al.* also indicated the need for empirical research. As Philips suggested that price discrimination is likely to be the most efficient from a resource allocation perspective.

Who better to understand the market place than the companies servicing those markets? Superficial knowledge of the Flagstaff market, gained from living there, combined with an understanding of economics allows for the analysis above. Management and marketing staffs of the gasoline retailers and wholesalers are likely to have a much better idea of their own markets. Data purchased by the Lundberg Survey and daily sales can certainly be used for rigorous analysis.¹⁵ Proprietary econometric analyses are beyond the purview of the current report. Regardless of the rigor of analysis conducted, and modern computers and software allows for far more rigor, the basic premise of the market system still lies in Adam Smith's idea of the invisible hand where purveyors are understood to have the best feel for their markets.

Before moving to the political rhetoric surrounding the recent events in the gasoline and oil markets one other variation in markets is of vital importance: supply disruptions. The sheer size and importance of the petroleum markets in the U.S. economy rest on a fragile distributions system. Refineries have fires and breakdowns. Pipelines and other distribution assets need maintenance and occasionally have breakdowns as well. Weather can have deleterious effects on deliveries.¹⁶ The fragility of the distribution system also suffers from a lack of redundancy, so when a supply disruption occurs in one local market, California or Chicago, there is little likelihood that alternative supplies can be routed to the troubled area in the short-term. As a result, in order to avoid shortages, prices must increase.

Simple economic principles indicate that when supply is disrupted, prices must increase to avoid a shortage where all customers requesting the product at the existing market price cannot find the product available for sale. This situation results in the classic gas lines of the 1970's. Which event is worse, long gas lines of customers unable to purchase gas, or higher prices? The market clearing prices this past summer in Chicago and elsewhere did exactly what they are supposed to do: people may have grumbled, but they were able to purchase the gas needed for their necessary trips. On the other hand, the protesters' roadblocks in Great Britain late in the summer almost shut down the entire economy of the island nations of Wales and England.

THE POLITICAL RHETORIC CONCERNING THE OIL AND GASOLINE MARKETS

Recent events in the oil and derivative markets have stimulated numerous hearings, investigations and statements at state and federal levels. The importance of these markets to the U.S. economy cannot be understated. For reasons mentioned above, the public obviously raised concerns when gasoline prices jumped from historically low prices, many locations under a dollar per gallon, to substantially higher prices, some in excess of two dollars per gallon.

¹⁵ The Center for Data Insight at Northern Arizona University specializes in corporate partnerships related to analyzing very large data sets.

¹⁶ During the tempestuous winter of 2000, OPIS provided a series of press announcements free of charge. It was most interesting to see how the price of kerosene and other derivatives lurched upwards when delivery tankers were stranded off the east coast due to bad weather.

California's Attorney General

During 1999, it became evident that gasoline prices in California were substantially higher than most of the rest of the U.S. Leffler and Pulliam (1999, page 1) peg the average difference at 26.3 cpg with a peak of 45.2 cents. Leffler and Pulliam were recruited by California's Attorney General Bill Lockyer to study the issue.

On November 22, a press release from the AG's office pinpointed the reasons for the higher gasoline prices as:

...largely the result of concentration and control oil companies have over the production and sale of gasoline, the state's decision to require clean-burning gasoline and its relative isolation from alternative fuel supplies. (Lockyer, 1999)

Lockyer pointed to the idea that a lack of competition led to the increased prices. As a result he wanted to "pursue the investigation of the petroleum industry and ... carefully scrutinize the pending mergers of Exxon-Mobil and BP-ARCO." (Lockyer, 1999)

In May, 2000 The California Attorney General's office released the report from the Attorney General's Task Force on Gasoline Pricing. (Lockyer, 2000a and b)

The main reasons for high prices in California were: 1) limited supply since the California refineries are nearing capacity with little room for expansion, 2) the lack of alternative suppliers producing the special CARB gasoline, 3) the expectation that supplies of CARB will become even tighter when Arizona and Nevada require the new reformulation, and 4) the fact that California refineries tend to hold diminished inventories. Basic economic analysis clearly points to the fact that these conditions lead to high prices on average and peaks in the prices when demand peaks as in the summer or supply disruptions such as refinery fires occur. But the politician needs to lay blame.

The Task Force, and subsequently the Attorney General, focused on numerous issues on both the supply and marketing aspects of the market. In order to narrowly focus this article, only the discussion of zone pricing will be discussed herein.¹⁷

The Task Force investigated possible regulations and strategies specifically targeting the marketing practices of producers.

The AG's report focused on strategies limiting the producers' ability to act freely within the market. Tim Hamilton of the Automotive Trades Organization of California and Dennis DeCota of the California Service Stations and Automotive Repairs Association chaired two supposedly unbiased subcommittees.

The primary proposal was directed at increasing competition at the wholesale level by instituting "branded open supply." Other proposals were to (1) eliminate refiner zone pricing practices in setting their DTW {Dealer Tank Wagon} prices to lessee dealers and open dealers and (2) lessen the degree of vertical integration to encourage competition at wholesale supply levels through either divorcement or divestiture. Proponents argue that these policies could work in concert with a policy of open supply. (Page 34)

The first suggestion to limit market results is the introduction of so called open supply. This practice would allow any dealer to purchase gasoline from any wholesaler. When the dealer is selling branded gasoline, such as Texaco, then purchases would be limited to those wholesalers selling that specific formulation. The supposed argument is that this will reduce the retail price.

In a competitive market, buyers and sellers are free to seek out one another in order to find their best opportunity. Competitive markets are thus typified by a lack of barriers, whether contractual, physical or structural, between buyers and sellers. Where barriers exist, prices may rise above a competitive level. Proponents of branded open supply argue that contractual supply agreements governing wholesale supply of branded gasoline prevent dealers from obtaining the lowest cost source of supply. (Page 29)

The argument above is based on the simplistic assumption of a competitive market. As previously discussed from both theoretical and practical perspectives, retail gasoline dealers are not in a single competitive market. First and foremost, selling a branded formulation of gasoline indicates the dealer's recognition of an imperfectly

¹⁷ See Smith (2001) for a more complete discussion of non-pricing issues in the task force report.

competitive market. The benefits of selling a branded product include brand recognition and other associated benefits such as credit card purchases and market research.

Ronald Coase (1937) argued the rationale for contractual relationships as an avoidance of serial transactions each requiring a negotiation. Coase's theory is clearly applicable to the current issue. The branded supply contracts are just that: contracts. The dealer is not forced to enter any agreement. Unbranded independent dealers certainly exist, and are even usually the lower-priced dealers in an area. Dealers and wholesalers willingly enter into these contracts since each party is better off. One of the most important aspects is the decrease in risk associated with supply. Dealers are essentially assured of supply and the individual refinery is essentially assured of a purchaser.¹⁸

Open supply is a method to allow arbitrage similar to the proposed pharmaceutical legislation allowing U.S. residents to re-import drugs from Canadian retailers and wholesalers.¹⁹ However, as opposed to the previous example, this one has potential impacts related to output and supply lines. Refineries and distribution networks have been located and designed with an expectation of local market and dealer characteristics and company wide maintenance schedules. Open supply holds the distinct possibility of disrupting the entire production and distribution framework.

The inability to schedule deliveries and segment the market leads to two possible results. First, the wholesalers may very well initiate a pricing scheme akin to base-point pricing, where the base price is determined as coming from a single refinery and then transportation costs are charged as if the product comes from that site. Scherer and Ross (1990, pages 505-508) summarize an extensive literature as to the inefficiency of base-point pricing.

Second, nothing in the proposed regulations limits independent jobbers from segmenting their dealers and charging differentiated prices. If jobbers are unregulated then this will result in a wealth transfer from the wholesalers to the jobbers.

Umbeck and Barron (1999) indicate the classic price discrimination result that regardless of where the price differentiation takes place, the final retail prices will vary based on local demand elasticities. Thus, even if the wholesalers and jobbers are restricted, the street prices will still vary from street corner to street corner. Thus, open supply regulations will have no effect on street prices, and will simply result in a wealth transfer from wholesaler to jobber or dealer. It is obvious that the chairs of the two subcommittees have a desire for this wealth transfer, but the resource allocation and future supply issues are more important.

Refiners have invested and will invest in capacity based on their ability to engage in specific pricing practices. Jobbers and dealers have also invested in capacity based on specific expected practices. The long run result of open supply and the corresponding wealth transfer will reduce the profits of the refineries and therefore reduce expectations of refinery expansion and capital investment in the future. If the true remedy to the envisioned "problem" is due to supply capacity as indicated by the Task Force, then this regulation will actually exacerbate the problem by increasing current prices and reducing future capacity.

Open supply is imagined to reduce the practice of wholesalers from engaging in zone pricing. Since arbitrage possibilities are opened up, the refiners will no longer be able to charge differentiated prices. However, if open supply is prevented then the suggestion is to limit zone pricing. Furthermore, it could be inferred that regulations be passed such that all refineries within the state will be forced to charge the same net price in the sense of Philips. The Task Force indicates the importance of pricing practices:

...fair wholesale pricing, prohibits refiners from establishing price zones and requires them to charge the same price to all dealers supplied by a given terminal, except that the refiner could add the actual cost of delivery. (Page 31, emphasis added)

Recall the discussion above concerning the welfare effects of pricing practices. In welfare analysis, there is no concept of "fair." Prohibitions of any kind lead to transfers of wealth that cannot be analyzed as being socially beneficial or detrimental. However, what is clear is that total output will be reduced and some marginal locations will not be serviced.

¹⁸ Beyond the scope of the current discussion, but clearly resulting from similar issues are the ongoing problems of the electricity market in California. The instability of the wholesale market has the producers in a position of considerable market strength. At this writing, the State is attempting to develop long-term supply contracts of the very kind being discussed in this section!

¹⁹ This legislation is discussed in Smith (2001).

Prohibitions are clearly targeted at reducing the wholesalers' ability to react to market events, since they would:

...not be able to adjust wholesale prices downward in a certain area in order to drive a rival from that market and reduce competition. (Page 32)

As previously noted, anti-competitive pricing is already illegal. As such, prohibitions on zone pricing will have no effect on this issue. The vested interest of the subcommittee chairs however, leads them to contradict themselves since the prohibition on zone pricing will limit the wholesalers but not the dealers when it comes to seemingly anti-competitive behavior:

...dealers in high price areas may be able to reduce prices at the pump and increase market share without eroding their profit margin. (Page 32.)

Is the Task Force really suggesting regulations that limit the profitability of wholesalers, but simultaneously allow dealers to engage in price wars and anti-competitive behavior?

Neither open supply nor zone pricing prohibitions addresses the base issue of high prices in California since street prices will remain unchanged at best and may increase due to the added risks of open supply.

In conclusion, California Attorney General Bill Lockyer charged a task force to study gasoline prices in his state. Unlike the Arizona Attorney General's office, this inquiry was not apparently stimulated by an interest in uncovering improper behavior as defined by several federal and state anti-trust laws. Rather, the impetus seems to have simply been high prices in California and the fact that California's prices seemed higher than in other states. Following the report from the Task Force, AG Lockyer addended his comments and recommendations.

Attorney General Bill Lockyer's Comments and Discussion

Recognizing the importance of and potential for regulations on the market system as discussed above, Lockyer indicates that:

When markets are not working as they should, government has a role. When those markets affect virtually every business and citizen in our state, it is our obligation to take all reasonable steps to restore healthy and vigorous competition. (Page 40)

There is no evidence provided anywhere in the report indicating any analysis of any kind to even address the idea that the retail gasoline market in California is not working properly. The events clearly point to the reasons for both the relatively high local price and the pricing peaks as being market driven. If anything, the market structure and pricing strategies have helped hold prices down. Yet, the valiant politician proposes to: increase competition and reduce prices, develop a strategic gasoline reserve, require the state to purchase imported supplies of fuel for its own use, take aggressive steps to increase fuel economy and use of alternative fuels, free dealers to seek the best price for fuels and examine barriers to importing gasoline via pipeline.²⁰ (Pages 39-40) It is not clear how many of these proposals even fall within the purview of an Attorney General. Yet, "The Attorney General has some power to affect gasoline prices directly." (Page 39)

Furthermore "The Attorney General supports a branded open supply" (Page 61) because a policy of branded open supply would limit refiners' attempts to maintain different prices within a city by the use of zone pricing. While other proposals to address zone pricing issues may have merit and warrant further analysis, a policy of branded open supply appears to be the most effective way of addressing zone pricing practices with the least enforcement cost. (page 62)

The recommendations made by Attorney General Bill Lockyer, seem to serve several levels of political pressure. The seemingly high prices for gasoline raised public furor and outcry. The independent jobbers and independent leasees and operators with vested interests clearly have a short-run desire to increase their share of the pie. The Task Force included 30 members of whom 3 represented the Western States Petroleum Association. The WSPA members' comments were represented in the text of the report, but few of their concerns made it into Lockyer's comments.

²⁰ Again, see Smith (2001) for a full discussion of the additional policy recommendations.

So the question remains. Should the major refineries be regulated on their pricing strategies for economic reasons or political ones? Is the practice of zone pricing simply an example of good management, or does it hurt the market?

Connecticut's Attorney General

During the spring and summer of 2000, a series of international and local events resulted in severe price peaks in the markets for oil and its derivatives. Stormy winter weather kept tanker ships from docking and unloading. OPEC cut back on production. Supply disruptions combined with new environmental regulations resulted in extreme pricing peaks in some local markets. As such, gasoline prices became a lead story on the nightly news and throughout political discussions.

The news reports and the various dialogues led one to puzzle over how many different people, businesses or sectors can be blamed when something goes wrong! One example of the perverse types of finger pointing arguments is that of the Attorney General of Connecticut Richard Blumenthal.

Blumenthal (2000) echoed the California report since he blamed zone pricing and closed supply contracts.

The power of the major oil companies to charge inflated, excessive, arbitrary price results from gasoline franchise agreements dictating that gasoline dealers are required to purchase agreements products from a single supplier. As a result of such sole source provisions, gasoline dealers are powerless to seek or shop for a cheaper supply of gasoline. Hence, consumers in the higher price zones pay a higher retail price.

Zone pricing is invisible and insidious. It distorts the free market. It is possible only because of restrictive contracts that include sole source provisions. It benefits only the oil industry, to the detriment of consumers.

There is no need to repeat the discussion above or to comment on the politician's inflammatory rhetoric and diction. However, Blumenthal clearly ignores that some customers end up paying lower prices compared to non-discriminatory pricing. As with Lockyer, Blumenthal indicates who his constituents are since he has "worked closely with the Connecticut chapter of the Gasoline and Service Dealers of America to enact state legislation prohibiting zone pricing."

Indeed, Blumenthal's comments require very little discussion, except for the fact that they were made to the U.S. House of Representatives Judiciary Committee.

Oil companies claim that zone pricing is a response to competition, and is needed to help their dealers in more demanding market areas compete and maintain market share. Those claims are untrue and unsupported. The only real purpose of zone pricing is to allow oil companies to squeeze out extra profits from retailers and consumers wherever they see an opportunity.

Again, he ignores the lower-priced markets and claims the claims are "unsupported." What is the purpose of business within the framework of the United States society? It seems the obvious answer is to "squeeze profits ... wherever they see an opportunity." The controlling aspect of the market is competition. Like Lockyer, Blumenthal provides no evidence of collusive or anti-competitive behavior. Recall collusive behavior is the opposite of anti-competitive behavior. Either firms are colluding to raise prices, or one firm is charging inordinately low prices. And anti-trust behavior limits either option.

Lockyer and the Task Force specifically stated that a single refinery must charge the same price and only hinted at a state-wide limitation. Blumenthal goes much further:

No person engaged in the business of furnishing gasoline to retail distributors of gasoline may use a pricing system under which the wholesale price paid for gasoline by any such retail distributor is determined based on the location of the retail distributor in any geographic zone.

Ignoring the fact that Blumenthal misunderstands the size of gasoline refineries and wholesalers ("business" not "person"), and considering his audience he certainly seems to be calling for a national wholesale price. Further ignoring the resource allocation issues described by Philips, the consequences of national pricing, or even state-wide pricing foretells serious consequences when supply disruptions occur.

Consider the cases where any of the recent events take place: pipeline break, refinery fire or weather disruptions such as the east coast faced last winter. Wholesalers would not be able to enact market-clearing prices

when these disruptions occur. It is unlikely they would raise the national price to meet the locally required market price. Since refineries are already producing at near capacity, it is unlikely that supplies would be diverted without a financial incentive. Local dealers might be able to raise price to the market-clearing price, but then Blumenthal would be after them for price gouging as they earned exorbitant profits.

These two examples of political rhetoric concerning the market pricing of gasoline have only come about as retail prices have surged due to the combination of international, national, and local market events. The rhetoric and public uproar provide a background to discuss two additional concepts of price.

LITIGATION PREVENTION PRICING

The investigations and discussions by the Attorneys General of California, Arizona and Connecticut reviewed above provide a new definition within the realm of pricing strategies: litigation prevention price. This is the maximum price that can be charged before the threat or investigation of litigation becomes a reality.

A Reuters report (Reuters, 1999) clearly defines this novel term. Following supply disruptions in California, calculations indicated that the average price should have been around \$1.50 but was actually \$1.33, since protests and investigation concerning anti-competitive behavior had been launched in 1998:

Big oil could be staving off a price hike this time around and selling gasoline at a loss because they hope the current spike is temporary. They may fear unleashing the same sort of political outcry they saw before.

Large West Coast marketers...might hold down California retail prices even as crude oil prices hover at near 19-month highs.

“Oil companies have been getting beat over the head and shoulders over pricing, so there’s no doubt if it’s a temporary phenomenon they may try to absorb the difference for a short time for political reasons,” said John Vaultrain, vice president at Houston based consultants Purvin & Gertz.

This litigation avoidance pricing strategy is novel and has no corollary in market analysis in the traditional economic models. But from a perspective of Finance theory, it makes perfect sense. If the litigation and investigation of pricing behavior are likely to result in legislation and regulation akin to those suggested by Lockyer and Blumenthal, then absorbing the added costs can make strategic sense. However, the wholesalers must be careful of too much cost absorption because charging prices below marginal cost might see them accused of anti-competitive behavior.

PANOPLY OF UNNECESSARY MARKET CONTROLS

The discussion above has focused on the retail gasoline industry and proposed regulations facing producers. These regulations have been shown to be either specious in nature or simple wealth transfers from the producers to the distributors or dealers. Given the importance of internal combustion vehicles to the U.S. economy, price increases or supply disruptions in this industry quickly gain importance in the news media and on politicians’ radar screens. The lessons learned from this investigation can now be applied to a wide variety of markets.²¹

How firms actually price over a real-world heterogeneous landscape was studied by M. L. Greenhut (1981) who found empirical evidence of widespread spatial price discrimination in West Germany and Japan. Somewhat similar results applied to the United States, even though the nation's antitrust laws and international trade policies limit a firm's use of this pricing strategy. The rationale for a restrictive statute is the so-called anti-competitive nature of differential (discriminatory) pricing over space. For example, many Japanese firms selling their output in the United States at a lower delivered price than in Japan have been accused of dumping their products on the U.S. market, with the presumed effect of potentially driving U.S. producers out of business. The implication is that lower

²¹ Extended thanks go to both John and Mel Greenhut for many hours of discussion and support on the following presentation.

delivered prices at greater distances from the seller's plant are evidence of anti-competitive behavior. But any simplistic conclusion along this line is quite incorrect in the backlight of a real-world heterogeneous landscape.

One main purpose of the present article is to indicate that spatial price discrimination of the so-called zone pricing or dumping form does not provide *per se* evidence of anti-competitive or collusive behavior. In fact, this article has discussed the fallacies of focusing undue attention on delivered prices. J. Greenhut and Smith (1993) demonstrated for instance that in certain situations delivered prices would be *lower* for *distant* buyers in a fully competitive (and nonpredatory) market than for those located near the seller's home site.

Statutory policies and bureaucratic practices, which define acceptable pricing in and between free enterprise economies, must, if used, relate only to indisputable predatory or collusive behavior on the part of the powerful. As the economies of this world become ever more tightly interwoven, yet continually face the fragility imposed by long-lived national rivalries and its potential exploitation for internal political gain, there should be no guesswork involved as to whether a firm's (or industry's) behavior is predatory. The panoply of pricing possibilities presented by J. Greenhut and Smith suggests that appearances can be misleading. Before constraints on trade are imposed, the case against the predator or colluder must be unequivocal.

In the framework of classical spatial theories presented by Hoover (1937), Lösch (1944), M. L. Greenhut (1956), and more recently Philips (1983), judging discriminatory pricing would appear to be a straightforward process. Unfortunately, the classical view of spatial pricing has been too simplistic. By recognizing *and* analytically identifying the effects on delivered prices of not only selected demands or different demands and different competitive conditions, but also the effects on delivered prices of varying quantities sold and varying freight costs schedules (i.e. transport economies and diseconomies), a more robust understanding of the multiple, complex patterns which can underlie a space economy is obtained.

At the same time it is humbling, for the reality is that simply observing the delivered prices provides insufficient evidence of geographic price discrimination, or for that matter of f.o.b. pricing.²² Many forms of price differentials and freight cost inclusions are natural,²³ including uniform pricing, prices which appear to be directed against distant buyers (i.e., where mill prices increase over costlier distances), prices which do not appear to involve freight impacts at all (i.e., constant mill prices), and mill prices which decrease at costlier distances and thus appear to cater to distant markets.

Judging whether prices are predatory, collusive or merely profit-maximizing then is not as simple as merely observing the price patterns. Rather, it requires rigorous estimation of transport cost functions, demand elasticities at different points in space, and identification of competitive relations -- tasks that we fear are far beyond the empirical ability of present-day economists and government officials, let alone lay jurors.

If economics has advanced at all over the past several decades as exemplified by the fields of rational expectations, game theory, open economies macroeconomics, and the like, the lessons learned point to the complexity of assessing economic behavior. There was a time when many economists thought input-output models would allow governments to better plan the future of the economy than could be achieved by the invisible hand. Yet, when it comes to microeconomics, government officials continue to regulate as if we still live in the days when giant trusts ruled the country and simple economic theory filled our journals. Until economists can provide clearer and more definitive tools for detecting unfair competition, we urge government officials to tread gently in this area, lest *regulatory interferences over what are or are not fair prices in an economic landscape appear arbitrary and presumptuous, and result in increased inefficiencies.*

²² The J. Greenhut and M.L. Greenhut (1977) paper recognized that spatial price discrimination could in fact apply under a constant net-mill price throughout the firm's *homogeneous* market space. Such demand type is quite extreme, which of course was the point of the article.

²³ The J. Greenhut and M.L. Greenhut (1977) paper showed "in conformance to classical homogeneous landscape assumptions" that a strict f.o.b. mill price system could, itself, be derived from a spatially discriminating price system. See d'Aspremont, Gabszewicz, and Thisse (1983), Coyte, Lipsey, von Hohenbalken, and West (1989), Eaton and Lindsey (1978), Norman, (1981), Norman and Nichols (1982), Gee (1985), Lederer and Hurter (1986), Macleod, Norman, and Thisse (1988), Thisse and Vives (1988) on factors yielding spatial price differentials.

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