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COSTS OF SEARCH AND RACIAL PRICE DISCRIMINATION

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There is some evidence that blacks pay more for consumer durables than do whites.[1] The introduction of bigoted sellers into the perfect competition model does not give this result unless (almost) all sellers and potential entrants are assumed to be bigots. But if there are costs of information, then we may have higher prices for blacks predicted by a model in which there are but a few bigoted sellers. We develop such a model to analyze racial price discrimination and to interpret empirical studies of the ghetto marketplace. This model permits us to analyze the price discriminating behavior of profit-maximizing[2] sellers in the consumer durables markets—markets in which low cost forms of price search such as looking at sticker prices give only a rough estimate of the true transactions price.[3] We focus on the purchase of consumer durables because we know them to be commonly sold to different buyers for different prices by individual sellers (Primeaux 1970). In many instances, this is due to lack of price posting and to bargaining for lower prices. For instance, Caplovitz finds that few furniture and appliance stores in East Harlem use price tags or adhere to "one price policies" (1967, p. 17). There is also evidence that blacks (or Mexican-Americans, ...) may be quoted different prices by the same sellers and for the same

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1. Some of this evidence is cited in text and footnotes below. The above conclusion does not hold for food. As stated by Berry in a review of low-income marketing: "Whereas little evidence has been found thus far to indicate widespread abuse of low-income, retail food distribution, more substantial evidence has been found to indicate significant abuse in the retailing of furniture and appliances in these areas" [1972, p. 50]. A typical example is a TV set wholesaling at $109 which retails for $130 at a "general market retailer" and for $220 at a "low-income market retailer" (Federal Trade Commission 1969, p. 79). See also (Caplovitz 1967; Sturdivant 1968 and 1969; Sturdivant and Wilhelm 1969).

2. Profit maximization equalizes price paid by all buyers in a frictionless perfectly competitive world, but may do the reverse in a world with costly price information. For credit sales higher prices may flow from realization (or belief) that the buyer cannot get credit elsewhere.

3. Often prices are not even posted or are bargained to below list, cf. Caplovitz (1967, p. 17). At other times consumers are told that the list price doesn't include, for example on automobiles, undercoating, vinyl upholstery, etc., and that stripped down models have to be special-ordered which takes a long time. This use of "bait and switch" sales techniques may be common for low-income sales of durables, cf. Berry (1972, p. 44). For a study of price differences charged by single sellers, see Primeaux (1970).

good.[4] There are of course other products for which this is true as well; for instance, prescription drugs. In fact one study found racial price discrimination for prescription drugs in one city (Hastings and Kunnes 1967), although in another city there was no evidence of it (Kotzan and Brancher 1970).

The standard arguments offered as to why blacks may be charged more than whites for the same product include bigotry, market power or higher costs of service (higher theft rates, default rates on credit purchases, etc.). Blacks may pay higher prices because they patronize higher priced stores or because of price discrimination within stores, cf. (Caplovitz 1967, p. 92; Sturdivant and Wilhelm 1969, p. 114). The question becomes, "Why would blacks pay these higher prices rather than going to less expensive stores or non-discriminating sellers?"

In a world of perfect competition with free factor mobility and costless buyer price information and mobility, price differentials cannot exist except under very strong conditions. Let us establish those. Assume that all sellers have the same technology and that all buyers have the same preference functions. (These conditions may be weakened with analogous results.) Further assume that some sellers are profit maximizers whereas other sellers maximize utility functions with a positive taste for money and with either distaste for blacks or positive utility for disadvantaging blacks. Those wishing to disadvantage blacks may post higher prices but, as we shall show, will make no sales to blacks if they do so. Finally assume that the number of pure profit maximizing sellers as a proportion of total sellers is at least as great as the proportion of the population that the other sellers (would) discriminate against.

In this case final market equilibrium will be characterized by all sales being made at marginal costs and all marginal cost levels being equilibrated. There are a sufficient number of non-discriminating sellers to permit a corner solution in which members of the disadvantaged minority purchase only from profit maximizers, although profit maximizers may sell to all racial groups. The "discriminators" will sell an equal amount and earn the same profits (zero in the long run) as profit maximizers,

4. Studivant and Wilhelm (1969, pp. 113-115) show this for a sample of purchases. In a study of 9 stores and 24 potential purchases, prices quoted varied slightly between customers of different races asking for the same TV set at the same store. Prices plus credit terms were highly variable by race (holding income and other factors constant). This study did not enter into any bargaining phases, and the results of bargaining would probably have been lower prices, cf. Primeaux [1970]. Sturdivant and Wilhelm point this out particularly for the Mexican-American community. Caplovitz says, "In the large bureaucratic stores where prices are standardized the race of the customer does not affect the price. The neighborhood merchants and peddlers, on the other hand, ... apparently do take the race of the customer into account" (1967, p. 92). Unfortunately Caplovitz's tables aggregate across brands and other characteristics, making any empirical evidence extremely difficult to interpret (1967, p. 91).

but will make no sales to members of this group.

This model may also be varied to allow for more inelastic demand or greater demand being exhibited by either purchasing group with the same result—all people buying at the same price. This will occur if the proportion of profit maximizers is at least as large as the proportion of sales that would be made to the disadvantaged minority at the price that would equate total market demand to the horizontal sum of all sellers' marginal cost curves (which is not unambiguously the supply curve in this type of problem).

Accepting the proposition that for some goods, members of some minority groups do on average pay higher prices than other members of society, how can we reconcile this with the above? If one were to assume that sellers know that some white buyers derive disutility from buying in stores along with blacks, it would not change this result. In the world of perfect competition described above this only imposes more corner solution properties on the final outcome. The final prices remain the same for all buyers unless there are too few profit maximizing sellers. Thus the answer why blacks (Mexicans, women, etc.) would be on average paying higher prices must rest on some violation of the conditions for perfect competition. Some evidence indicates that intra-store price differentials may in fact be quite large and thus inter-race intra-store price differentials may be quite large; cf. (Primeaux 1970, p. 425; Sturdivant and Wilhelm 1969, pp. 113-115).[5] The lower prices paid by one group of individuals will occur due to lower price quotes and/or a stronger bargaining position. Although we generally refer to price quotes throughout this paper, the same argument applies for bargaining situations. Game theoretic models, although generally crude, do in fact yield the plausible result that when bargaining position is worse, the final outcome is less advantageous; cf. Luce and Raiffa [1976, pp. 126, 135].

One possible violation of the assumptions of perfect competition that would yield this result is the existence of interregional transportation costs yielding some seller locations with few sellers serving some subset of buyers and in conjunction with higher costs of doing business for sellers

5. Primeaux (1970, p. 425) shows substantial *non-credit* price variability on the basis of consumer characteristics other than race. This reinforces our opinion that not all of the differences in prices *including credit* can be attributed to riskiness of extending credit.

Credit markets, even if perfectly competitive, should either limit credit or else charge different interest rates on the basis of default rates, cf. (Stigler, 1969; Jaffee and Modigliani 1969). Higher prices in stores frequented by those with poor credit ratings may in fact be a way of avoiding maximum interest levels set by law. On the other hand many prices charged in low income areas would earn the retailer as high a gross margin with a 50% default rate as a non-credit sale (FTC 1969, p. 102). Also profit rates appear to be higher for these stores even after all collection costs are subtracted (FTC 1969, pp. 103, 106). We do not feel that this is only a risk premium or that these prices are in line with default rates.

who are located in the region with the disadvantaged minority. In this case we arrive at a solution with the disadvantaged minority paying higher prices even without the existence of price discrimination. Cf. (Federal Trade Commission 1969; Sturdivant 1968, p. 135).

Another possible violation of the competitive conditions that would yield this result is high seller concentration and some form of collusion in conjunction with high barriers to entry as well as market demand curves that are more inelastic for the minority group at each price level.[6]

But the existence of retail price differentials that remain over long periods of time in areas characterized by reasonably low transportation costs [cf. (Berry and Solomon 1971, pp. 44-5; Goodman 1968; Feldman and Star 1968, p. 219)] cannot be very well explained by the above, particularly in light of the ease of entry to retailing. Even harder to explain, given these conditions, would be non-credit sales from a single market outlet at racially determined prices. For this to occur we need some further violation of the competitive assumptions.[7]

I. COSTLY PRICE INFORMATION AND PRICE DISCRIMINATION BY RACIAL GROUP: A THEORY[8]

Let us consider an atomistic market in which a homogeneous product is sold and in which there is free entry and exit (and other forms of free buyer and seller mobility) but in which there is costly price information. Spatial characteristics will be assumed away (or at least neutralized) at this stage of the analysis. The sellers in the market could be visualized as being located in a single skyscraper and the population distributed in a ring around it.[9] To get a price quote a buyer needs to enter a slow elevator and go to another floor to ask for the quote. The time in transit will be assumed to be independent of the number of floors traveled. We shall also assume that transactions prices are quoted indi-

6. This is in fact, for many goods, counter to our intuition. For most goods we would expect richer people to have more inelastic demands at any stated price, and income is positively correlated with race. On the other hand tastes are race-correlated too. This and other factors may contribute to possible demand inelasticity being exhibited by low income buyers.

7. This may be just as important or even more so in the labor purchase decision, cf. Bergmann (1972). In fact, in the consumer durables markets many purchases are on credit. Thus differences in default rates may explain some price differences. In a study by Primeaux, which did not consider racial determinants of price, only 2 of 32 durable goods retailers who admitted to this type of price discrimination ranked credit rating as the most important determinant of their price shading. There were only 5 retailers who did not admit to price discrimination (1970, p. 420).

8. For a mathematical interpretation of the model see the Appendices. For a fuller discussion of a closely related model see [Masson 1972].

9. Not all buyers need be the same distance from the market place as long as distance from it is not correlated with race. People who live farther away may search less, cf. (Bishop and Brown 1969).

vidually to buyers.[10] The sellers know nothing about individual buyers except for their race. For instance they know nothing at all about buyer income, education, intelligence, location of residence, etc. These too may enter into the pricing decision if known, cf. (Caplovitz 1967, p. 17; Block 1972, pp. 11-13; Cox et al. 1972, pp. 59-64; Masson 1972). Related empirical evidence is available in Primeaux (1970).

A. The Buyers' Side of the Market.[11] To help conceptualize the effect we wish to demonstrate, assume that although the forms of utility functions may differ between buyers, these differences in form are not correlated with race. *Also assume, for now, that buyer incomes (and credit worthiness), education, etc. are not correlated with race.* Obviously income and education and, I would guess, preference functions as well are indeed correlated with race. *The model is analyzed holding all other things constant, and these other factors may accentuate or offset (at least in part) the phenomenon under discussion.*

This gives us market demand curves that "look the same" in the sense of having the same elasticities at each price for the aggregate of all blacks and that of all whites.[12] *Further assume that buyers know approximately what the distribution of prices looks like but have no information about individual prices.*[13] The market period—the primary period of analysis—will be that time within which each person searches for an acceptable price quote and then purchases a unit of the product.

During a market period potential buyers may conduct leisure-using or otherwise costly price searches. For now we shall assume that the buyer may search several times and make a purchase at his lowest sampled price. The buyer derives utility from the purchased commodity, leisure, and the amount of money remaining after buying this commodity. For ease of exposition we shall assume that the commodity is indivisible and that the buyer purchases exactly one unit of it.

A buyer will search at least one time (unless the lowest possible expected price is greater than his endowment of money) and then search

10. Or prices could be posted within and outside of the shop if these prices are only binding as maximum prices.

11. See Appendix A for a mathematical interpretation of the buyers' side of the market.

12. Market demand curves become bands when there are search costs and we shall argue that search costs may differ by race. These demand bands may differ for this reason. The demand curves that are the same are the perfect price information demand curves.

In Appendix A the market demand curves are assumed to be both perfectly price and leisure inelastic (if to purchase a product costs leisure). This removes problems of "demand bands" rather than unique demand curves.

13. This finesses the problem of how the form of the price distribution is learned. This also means that buyers carry no seller specific price information over from their last purchase or have not previously purchased this product. By this means we remove complicating "goodwill" factors.

additional times if the expected utility of an additional search is at least as great as the utility to be derived from not searching again. If an acceptable price is found and no additional searching is done, then the buyer has utility given by: (1) his income minus an amount of dollars equal to his lowest sampled price; (2) a unit of the commodity; and (3) an amount of leisure given by his initial endowment of leisure minus the amount of leisure used per search times the number of searches he has undertaken. If he conducts another search, then his stock of leisure goes down by an amount equal to the time necessary to make one search. On the other hand he faces some probability of finding a lower price and thus having more income left over. *Ceteris paribus* a buyer is less likely to search if:

(a) his lowest sampled price is lower;
(b) he has a higher marginal evaluation of leisure;
(c) his assessment of the price distribution is that it is "higher";[14]
(d) the amount of time needed for an additional search is longer.

We shall, in this section, focus on (c). Obviously if, as we have assumed for now, all buyers have exactly the same utility functions, incomes, education, and search time and ability, or if utility functions, incomes, etc. are not racially correlated, and starting with the initial distribution function we change it such that some sellers charge black buyers higher prices due to bigotry, then *for any given previous price quote* the average black should be less likely to conduct a further search than the average white. This means that blacks, *ceteris paribus*, would pay higher prices than whites even if non-bigoted sellers do not price discriminate by race. Assuming diminishing marginal utility of leisure, as more searches are undertaken, the buyer's marginal evaluation of leisure rises. As this happens, his acceptance price will rise, i.e., he is more likely to find any individual price quote acceptable. If some price quotes for blacks are higher than those for whites, then, *ceteris paribus*, for any fixed number of searches:

(a) blacks face a lower probability of having found a price below any fixed level; and
(b) blacks should expect it to be less likely for the next prices sampled to be below any given level, and thus they would have higher acceptance prices.

Thus blacks in these circumstances may either *search* more or less, but would on average *pay* more than whites.

B. The Sellers' Side of the Market.[15] The sellers will be assumed to be

14. At least in the sense of "First Degree Stochastic Dominance," e.g., the distribution function of one distribution being nowhere to the left of the other, cf. (Hadar and Russell 1969).

15. See Appendix B for a more formal modeling of the sellers' side of the market.

of two types, racially prejudiced and not racially prejudiced. We shall first examine the decisions of a non-prejudiced seller. He will be assumed to maximize his expected profits. For analytical simplicity let us at first assume that all sellers have horizontal marginal cost curves. We shall also assume some fixed costs which, for convenience, assures a breakeven point above MC. Obviously no profit-maximizing seller will quote a price below marginal costs.[16] In fact, as long as there is a finite probability that some buyers will accept prices which are above marginal costs (and sellers are not able to gain low price reputations), all price quotes given will be above marginal costs. Sellers arrive at this pricing rule by weighing the additional marginal expected gain in probability of retaining a customer from lowering price with the marginal opportunity loss from lowering the price.[17] Profit maximization means that we may analytically treat customer subgroups independently and that we can use expected value points of demand relationships in much the same fashion as certainty demand curves. (See Appendix B.) We shall finally assume that sellers can set prices to quote to blacks and prices to quote to whites and that these prices cannot be changed during the market period.[18]

Just as in a certainty case, if at any given price the elasticity of the (expected) demand curve is lower for one group of purchasers, then the profit maximizing seller should charge members of this group higher prices, cf. [Ferguson 1969, p. 280] and Appendix B.

The other group of sellers are prejudiced sellers. Let us, for simplicity of presentation, assume in Beckerian fashion[19] that the prejudiced sellers follow exactly the same pricing rules except that they add some amount to their profit maximizing selling price whenever they are asked for a price quote by a black.

C. Integrating the Buying and Selling Sides of the Market. Now let us analyze the market conditions and the pricing decisions for a profit maximizing seller. Assume first that all profit maximizing sellers charge both blacks and whites the same prices. Thus, *ceteris paribus*, the prejudiced sellers should charge blacks higher prices than whites. In this case, *given any previous price quote* and number of searches an average black

16. This is a consequence of assuming away goodwill effects and multiple product dealers.

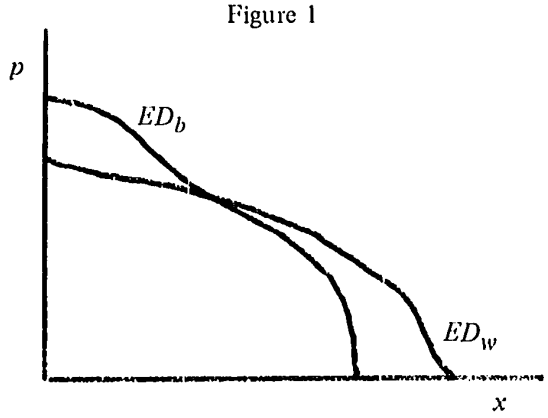
17. In a survey of the search literature Rothschild (1973) notes that all previous search models that assume maximizing behavior on both sides of the market (and do not use counterintuitive expectations generation hypotheses) yield this price above marginal cost (wage below marginal revenue product) result.

18. The reason why we wish to have sellers' prices held constant for the market period is that otherwise there may be some tendency to raise (or lower) them over time. The buyer model is associated with an increasing acceptance price over time [Masson 1972]. The thrust of the assumption is that we wish sellers not to be able to guess whether this is a buyer's first or his n-th search.

19. Cf. Becker (1971, p. 14).

would be less likely to conduct another price search than would be an average white. The search technology and the existence of some bigots will generate expected demand curves for each consumer group as seen by individual profit maximizing sellers. These in a comparably scaled form are shown for black and white buyers in Figure 1.

Figure 1



The horizontal axis, x, is the expected proportion of buyers, black or white, that will buy from this seller at any given price quote, p. ED_b is the expected demand of blacks as seen by this seller and ED_w is the expected demand of whites. (Remember that the total market demand curves are vertical.)

Given any previous lowest price quote, a white finds it more likely that one more search will yield a lower quote. One likely situation, although it need not occur, is that on average blacks search fewer total times than whites.[20] Figure 1 is drawn using this assumption with ED_w to the right of ED_b for very low price levels. If blacks search more total times than whites, then ED_w will be to the left of ED_b for low price levels. In either case ED_w will be below ED_b for sufficiently high price levels.

Since for any given past lowest price quote whites are more likely to find a lower price if they continue to search, it would not take as high a price to drive all potential white buyers away from a single seller as it

20. The proposition is that after finding a price quote from one non-bigot, the black is less likely to search again than the white. If the probability of finding a non-bigot is very low, an average black may search more than an average white. Also if the good is generally thought to have a very tight price distribution such that whites generally search only (let us say) once and several blacks when confronted with bigoted sellers search again, then blacks on average will search more than whites. More generally, as long as the proportion of bigots in the market is low (but non zero) and the average number of searches optimally undertaken by whites is high, then the blacks will on average search less than whites. Who, black or white, searches on average the most totally is, as will become clearer below, irrelevant. What counts are the potential gains from search which for the black are both higher, if he has found a bigotedly high quote, and lower, because he might again sample a bigot's store.

would to drive all potential black buyers away from the seller. Thus on average at any price the expected demand curves seen by an individual seller will be more inelastic for blacks than for whites.[21] Rather than referring to averages, let us assume that since the expected demand curve ED_b is clearly more inelastic than ED_w for most prices[22] that ED_b is more inelastic than ED_w at any price level. This would be clearly true if we assumed demand curves to be straight lines. *Thus any individual profit maximizing seller should charge blacks higher prices than whites even if other profit maximizing sellers do not do so.*

But this is not where the process stops. Holding the number of firms constant for now, we find that each profit maximizing seller will charge blacks more than whites. Thus the price distribution faced by blacks is relatively even higher than one in which only bigots charge blacks higher prices. Elasticities of expected demand will diverge even more. *Price discrimination by racial group becomes pervasive even if only a minority of sellers are prejudiced.* The existence of some prejudiced sellers acts as a catalyst creating a system of feedback effects raising all sellers' quotes to blacks above those quoted to whites. In fact in this type of market in which list prices are not used or are not adhered to, the prices charged blacks will become higher than those charged whites by more than an amount that approximates the reduced expected costs of search that would exist if only prejudiced sellers were price discriminating.[23]

There is a very close analogy between an *ED* curve and a Chamberlinian *dd* (the firm's demand) curve. The bigotry effect makes the small *dd* curve (our ED_b curve) at the relevant price level less elastic which raises individual sellers' profit maximization prices. As all sellers raise their prices the price distribution shifts up feeding back into a new optimal pricing policy (e.g., moving up the Chamberlinian *DD* curve which is not shown on our graph). Keeping the analogy in mind may make later sections clearer, but importantly we must remember that the prices are in a distribution, not at a single level, and that we need not have (in fact virtually require having no) symmetry assumptions in our analysis.

D. This Result Over Time. For this basic result to retain its validity over time we need two factors:

(a) that all prejudiced sellers do not exit from the market;

21. Because elasticities are independent of scaling we may use the elasticities of proportional demand curves directly. Also it is easily demonstrated that if the tangents of two demand curves at the same price levels intersect the vertical axis with one above the other, that the demand curve with the higher tangent is more inelastic at that price.

22. Unless there are very odd curvatures to these curves.

23. A similar proposition in reverse is also true for wages paid women and blacks of quality comparable to that of white males.

(b) that buyers do not gain all possible price information by repeat purchase or word of mouth.

If all cost functions are alike and if we do not allow buyers to learn who the prejudiced sellers are, and we allow entry and exit of (risk neutral) firms, the expected profits of the profit maximizing firms in the long run will fall to zero.[24] We further find that the prejudiced sellers would, on average, have negative profits and thus may tend to exit from the market. On the other hand, if prejudiced sellers enjoy quoting blacks high prices and if this is included in the opportunity cost measure, then there is no reason for them to exit (even in the long run). A similar analysis is done more formally (as in our appendix) by including a utility of "charitable behavior" to a physician's objective function in [Masson and Wu 1973]. A similar phenomenon for discrimination in hiring is discussed in Arrow (1972). Even if this were not the case, the "short run" may be sufficiently long for the existence of bigoted sellers to be common as a market phenomenon.

Entry of firms will continue in this model as long as entrepreneurs have knowledge of positive expected profits. This knowledge may be from trade publications, etc. As long as there are fixed costs of production, as were assumed above, then we arrive at a point where expected prices are equal to average costs which are above marginal costs. (Again we have analogous results in monopolistic-competition if costs are linear in output but have a fixed cost component.) If we hadn't assumed fixed costs, then we would have had an *infinite* amount of entry and expected profits thus, in the limit, approaching zero. Price will still remain strictly above marginal (equal average) costs, and possibly by a finite amount (see Masson [1972]).

Another reason why these price differentials could disappear in the long run is that black buyers could over time identify the prejudiced sellers (a process complicated by the fact that in the interim all sellers will be price discriminating to some degree). It is true that good information transmittal within the black community could remove these price differences in the long run. One might in fact expect the black community in this case to make more use of intracommunity information (e.g., word of mouth) than the white community. Block (1972) cites some evidence that for durable goods purchases, after adjusting for income, this is indeed true. But the intracommunity information requirements necessary for totally eradicating this effect are quite high. And although he found a higher proportion of blacks than whites using this word of mouth "per-

24. This assumes that all firms are exactly alike and that there is no goodwill effect that would give established firms an advantage over potential entrant firms.

sonal information," the proportion was only 24% of his sample (pp. 9-10). Furthermore, of the poor people in his sample only 5% compared prices between stores before buying consumer durables (p. 5). Here it is crucial to realize that we are discussing products that are not sold with easily observable sticker prices or with any sticker prices at all. Also unless friends are buying exactly the same make model, and vintage, product, word of mouth will not reduce information costs as much as they would otherwise.

Let us consider some casual empirical evidence about costs of information in durables markets. Television sets are owned by most families. When we bought our latest TV set we searched six outlets over a two week period. The first five stuck to their sticker prices. Then we bargained until a salesman of a national retailer lowered his price fifty dollars (16-2/3%) below the sticker price. This is a commonly purchased item but most of our acquaintances did not know that such bargaining ever occurred. On the other hand, a couple of our acquaintances thought we should have driven an even harder bargain. Subsequently we searched five outlets to find a slide projector. In two stores we were explicitly told to bargain. Observed prices ran from well over 90% "of list" (Turnstyle) to 78% of list (Marshall Field) to 66% of list (independent dealer). Prices on a cheaper projector ran over an even wider range (again with a "discounter" charging the highest price). Even the meaning of a sticker price is not well known for these common products.[25] Primeaux also notes the same phenomenon. In his sample many firms would lower prices when asked. This of course works to the disadvantage of people who do not ask. In fact 59% of his firms estimated that they charged prices that varied between customers by 10% or more and 32% estimated it at 20% or more (1970, p. 425).

Even if bigoted sellers have the same opportunity cost levels as the nonbigots, the numbers of items commonly purchased, the complexity and perishability of price and quality information (for related evidence see (Morris 1971, pp. 21-25)), and entry and exit of both buyers and sellers in each market area lead one to believe that it would take (at least) a "long time" to converge to a long run equilibrium characterized by the exit of bigots and consequently no price discrimination.[26]

25. One study (LeGrand and Udell 1964) found that 39% of television buyers visit only one outlet. Similar results are reported in Smith as (1970, p. 25) 60% for "small" appliances and 47% for "major" appliances. In another sample of poor buyers, Block found only 5% of durables buyers compared prices in other outlets (1972, p. 5).

26. Even if a long run equilibrium were reached that looked like this, the information that must be pervasive in the community must be maintained or else the prices will again diverge, cf. Masson [1972].

II. SOME EXTENSIONS OF THIS PROCESS

In fact we do not find a world in which spatial characteristics play no role. Blacks often live in more or less localized areas and many shop for durables primarily within their own areas. A study by the Federal Trade Commission in the Washington, D.C. area arrived at a figure of 44% of low income *durable goods* buyers purchasing from "low income sellers" (FTC 1969, p. 91)[27] and has evidence indicating that prices of durables are higher in low income areas. The catalytic process by which the existence of some higher priced sellers raises the profit maximizing price for others to charge may play a similar, although different, role in these markets. Conceptualize two towns next to each other, one primarily black and one primarily white, and each with its own shopping center. Further assume that each potential buyer finds it less costly to search in his own market area. If all technical conditions and search costs are the same within each area and there are only profit maximizing sellers, then the price distributions will be similar in each market. Now assume that some bigots are introduced to the system and/or that some of the stores in the black city have higher costs than those in the white city. In either case for (durable) goods for which sticker prices do not have a high information content we should have:

(a) Even if interlocational racial price discrimination were impossible, stores with exactly the same technical costs as in the white area but located in the black area will (even if profit maximizers) charge higher prices; and

(b) within-store seller price discrimination should develop to the disadvantage of black buyers.[28]

27. The extent with which the low-income shopper stays within his area is subject to some debate. For different areas and in different studies we find some writers saying that low-income buyers concentrate their food purchases within their area (cf. (Sturdivant 1969; Wall 1969; Groom 1969)) and others finding the reverse conclusion (cf. (Goodman 1968; Berry and Solomon 1971)). In a study by Alexis we find a breakdown of distance traveled to stores (and other characteristics) by income group. He finds a clear relationship between income and shopper mobility (1972). In another study we find the not unexpected conclusion that there are certain specific locations blacks tend to shop (e.g., downtown) more than whites (Cox et al., 1972). But let us concentrate on evidence on durable goods shopping behavior. An FTC study indicates that in Washington, D.C. almost half of the sales of furniture and appliances to low income individuals were made in the low-income market area and we may expect that some of these purchases are locked in the area by credit availability, cf. Feldman (1970). In the FTC study 93% of the sales made were credit sales in the low income area although only 27% of the sales outside of this area were credit sales (FTC 1969, p. 77).

For our purposes we need only discuss a tendency in this direction. For durable goods that are not frequently purchased and which are not often "shopped around for" (cf. Smith 1970, pp. 25-26) one might expect a tendency for some geographic concentration of sales to yield some effects similar to those hypothesized below.

28. Of course for this to be true it must be profitable for some whites to buy at the stores in the primarily black city. If transportation costs between cities are not significantly lower than the additional marginal costs of doing business in the primarily black city, some of the white residents in this primarily black city may find it advantageous to patronize the stores in that city.

For instance, if in a black area theft, fire hazard, or other costs raise the costs of most sellers, but within this area there is a limited amount of land characterized by good lighting and new buildings, then the owners of the land or the businesses can extract an economic rent *even if in the relevant range all marginal cost curves as seen by individual sellers are horizontal*. If land of the same quality of safeness, closeness to consumers, etc. were located in the generally safer white area, this economic rent would not be forthcoming. An analysis of the FTC study shows much higher prices in the low-income area and also higher profit margins (1969, p. 103). Profit rates on equity for comparably sized low income stores are also higher for their sample (12.7% vs. 8.1%).[29] This is weak evidence, but it is consistent with the economic rent hypothesis.

This type of search model can also help us gain some insight into other market phenomena even in cases that are independent of the price discrimination question. For instance, our casual observation is that in many bargaining situations the seller will say that the low price he is quoting is "good only now, and will not be later." In the terms of this model, by so doing, the seller is attempting to lower the buyer's assessment of the expected value of another search. If the buyer feels that by searching again there is a finite probability that he will lose the ability to purchase at his last lowest price quote (from the buyer who gave him that quote), then he will be more likely to accept the quote and less likely to search further. A similar effect occurs when the last unit of a product is on the rack. In a bargaining situation, the last unit may sell for more.[30]

This model may be extended to deal with the values of loss leaders, of locating near shopping centers, and of deceptive practices such as advertising "stripped down models" but then not having them in stock.[31] These "bait and switch" techniques work by lowering buyer search costs for other products by exposing the buyer to them after baiting him into the store. Even if buyers learn over time, this may be a profitable "snatcher"

29. They do not feel that this is significant, and one infers that either they wish not to comment on poor data or that a "t" test would not strongly differentiate between these two groups (FTC 1969, p. 106).

30. There are also many reasons why the reverse may be true, such as shelf-space requirements on a low turnover item. Sometimes these last units are put on "closeouts."

31. Forcing higher markup models on some people by differentially applying longer waiting periods for some people may make effective price discrimination very hard to detect empirically. A store may charge all of its buyers the same price for each product but quote different buyers different waiting periods on the same product. The "easier to sell" buyer will be told that the low markup item will take 3 months to deliver whereas the "hard to sell" buyer might be told that it will come within the week. This type of effective "price changing" without changing the price is not uncommon. It appears to have been used by many businesses during the recent period of price controls to avoid blatantly breaking the law but still "raise prices," cf. (*Wall Street Journal*, Sept. 29, 1971, p. 1).

tactic. A potential buyer who wishes to go to a location to make a specific purchase has lower search costs than he might otherwise have had for examining other products sold at that location. The huddling together of stores into shopping centers also lowers the marginal costs of buyers in search. A store that is located away from a shopping center may be more likely to retain customers who come in (and thus maybe charge higher prices) but is much less likely to have customers to come in for the same reasons. One empirical study of this phenomenon is by Bucklin (1966).

III. CONCLUSION

There are some empirical studies which indicate that often blacks have to pay more for the same goods than would whites. There is also evidence that for certain products this may be because some sellers quote higher prices to blacks than to whites.[32] Of course to the extent that richer people are, *ceteris paribus*, charged higher prices these effects may empirically wash out in aggregates unless these are broken down by comparable education and income groups, cf. Masson [1972]. On the other hand, the lesser educated may, *ceteris paribus*, pay more, thus accentuating this effect, cf. Block [1972] and Primeaux [1970]. In this paper we show how costly price information may amplify price differentials. Although this may not be the *stimulus* for differences in prices charged by race (or sex) it may play an important reinforcing role in this process. If this is a sufficiently accurate description of the world, then government policies may be pursued that would reduce racial price discrimination. One set of such policies would be those encouraging price information, e.g., requiring price posting, which probably increases true price information at least somewhat.[33] A second and more appealing type of policy would be to increase consumer price searching efficiency by consumer education, since consumers often don't realize the extent of interstore price variability, or by increasing buyer mobility (e.g., subsidizing municipal transit routes that go through the ghetto). Finally it might even be possible to reduce price discrimination by increasing the availability of information on credit worthiness. By doing so we would lower search costs of black buyers looking for a coincidence of a low price plus credit availability, thus reducing possibilities for price discrimination. (We are not referring to price differences based on perceived credit worthiness "price discrimination.") If not all racial price discrimination is bigotry per se but effective

32. There is at least evidence that price plus credit terms may be considerably higher for blacks than for similar whites (Sturdivant and Wilhelm 1969).

33. Although in markets in which there are few sellers price posting may serve to increase seller information of others' prices and lead to higher rather than lower prices, cf. (Stigler 1964; Stelzer 1966, pp. 188-92, 203-11). For eyeglasses Benham (1972) shows that price posting lowers prices.

bigotry stemming from profit maximization and information costs, then optimal government policy to reduce racism will differ from one aimed solely at reducing hate and proscribing price discrimination.[34] Although we have not touched directly on the subject here, we expect there are similar policy implications for information on quality. In that case less informed individuals and those discriminated against would generally get higher prices and/or lower qualities. Increased enforcement of laws against deception, requiring fuller product contents description, and related actions such as instituting more consumer information services would in this case also tend to reduce economic discrimination against blacks, Mexicans, and women.

APPENDIX A
THE BUYER'S SIDE OF THE MARKET

In this appendix we sketch out the basics of the buyers' side of the market. This is closely related to a model presented in Masson [1972].

The i-th consumer will be assumed to have a utility function of the form $v_i(c,l,x)$, where x is the amount purchased of the good in question, c is the amount of money for consumption of all other goods (i.e., Hicks-Marshall money), and l is leisure. The model will be formulated using the assumption that *one and only one unit of x will be bought by each consumer*; this assumption helps us simplify our notation and manipulations. Keeping in mind that individuals' utility functions may differ, the utility function may be rewritten, dropping the subscript i for convenience, as:

$$[1] \qquad u(c,l) = v(c,l,x) = v(c,l,1)$$

The buyer's consumption level, c, is given by his income level, y, minus the price for a single unit of x, p, or $c = y - p$. His leisure, l, will be given by his total number of non-work hours, $\bar{L}$, minus the time, L, spent in search for lower prices, i.e., $l = \bar{L} - L$. The work-leisure choice is ignored here in part because many people, e.g., factory workers, have little flexibility in this respect (e.g., corner solutions at an employer-specified work week). If the work-leisure choice is added to the model, then high income individuals will have higher search costs (if search uses leisure), and the prices they pay may be higher due to this and/or Engels effects on the value of leisure. The search technology employed by the consumers in this model will be one in which they use leisure time to search for lower prices. This may be done by asking sellers for price quotes, by reading consumer oriented information, or by asking friends or relatives for information.

34. And of course analogous conclusions apply for wage discrimination as well.

The search problem is treated as a dynamic programming problem. We assume that on the "first day," the buyer is given his income y and his stock of leisure $\bar{L}$. He may spend leisure in search over the ensuing "days," but all financial transactions are assumed to occur on the "last day." Furthermore, we assume that he gets utility from his *total leisure* in each market period regardless of his leisure time stream within the market period. This greatly simplifies the model.

The buyer must decide at each time period whether to spend another unit of time, δ, for another price search or to accept the last lowest price quote he has received and spend no more leisure time in search. At each stage the consumer has to decide whether (a) to search again and have as a return the expected utility from that search plus the ability to search again if the search is unsuccessful; or (b) to stop searching at this stage (after which time he would remain *stopped*). At the point at which *he stops searching* we have:

$$[2] \qquad u(y-\bar{p},\bar{l}) \geqslant \int_{\bar{p}}^{\infty} h(p)dp\, u(y-\bar{p},\bar{l}-\delta) + \int_{0}^{\bar{p}} u(y-p,\bar{l}-\delta)\,h(p)\,dp$$

where: $\bar{l}$ is the amount of leisure remaining after previous searches,
$\bar{p}$ is his previous lowest price quote, and
$h(p)$ is the probability density function of prices to be drawn from if δ units of leisure are used for one more unit of search.

The left-hand side of equation [2] is the utility of no search and the right-hand side is the (expected) utility of search. Note that $u(y-\bar{p},\bar{l}-\delta) < u(y-p,\bar{l}-\delta)$ for any $p<\bar{p}$. If $h(p)$ as seen by blacks, $h_b(p)$, looks exactly like $h(p)$ as seen by whites, $h_w(p)$, except that some of the sellers are seen as charging blacks higher prices, then:

$$\int_{\bar{p}}^{\infty} h_b(p)\,dp \geqslant \int_{\bar{p}}^{\infty} h_w(p)\,dp \quad \text{and}$$

$$\int_{0}^{p'} h_b(p)\,dp \leqslant \int_{0}^{p'} h_w(p)\,dp \quad \text{for } p' \leqslant \bar{p}$$

The first of these holds with strict inequality if there exists any bigot who sells to whites below $\bar{p}$ and blacks above $\bar{p}$ and the second is a strict inequality if there exists one who sells to these groups below and above p'. Since the left-hand side of equation 2 is, for any past search experience, fixed, and the introduction of bigots raises the right-hand side, we arrive at the conclusion that if there are bigots in the market, blacks will be less likely to search *given any past number of searches and lowest observed price*. (If there are many heterogeneous potential buyers, then we needn't worry about corner solutions.) Using this framework we may introduce the existence of bigots before any searches are undertaken and analyze the

recursive properties of the model. Given any past history of price quotes a black would be less likely to search than a white, but on average the black's past history will have higher sampled prices in it and in particular the lowest sampled price will, on average, be higher as well. These conditions will assure us that, as seen by a single seller, the proportional expected demand curve for blacks will be to the right of that for whites, at least for very high prices and possibly for all prices.

Finally, analogous conclusions obviously apply if we, by the feedback mechanism developed in text, find more (nonbigoted) sellers quoting higher prices to blacks than to whites.

APPENDIX B
THE SELLERS' SIDE OF THE MARKET

A typical nonbigoted seller is assumed to be an expected profit maximizer. When he is asked for a price quote by individual i, he will offer his product at a price p_i. The only information the seller has about individual i is his race and that he will purchase one unit of product from some seller. The seller will be assumed to fix on the "first day" of the period the price p_b to charge any black individual and p_w to charge to any white individual. He believes that, if he charges p_b, the probability of having at least a proportion, X_b, of the black buyers is

$$[3] \qquad F_b(X_b; p_b, \mu_b) = \int_0^{X_b} f_b(x; p_b, \mu_b)\,dx$$

where: $F_b(\cdot)$ is a cumulative probability distribution function,

$f_b(\cdot)$ is a probability density function,

X_b is a proportion of the black population,

x also represents a proportion of the black population,

μ_b is a vector of parameters, some important ones describing the seller's assessment of the distribution of prices that competitors charge blacks and also of levels of black incomes, education, tastes, etc.

If there are B black individuals in the total population, then the seller's expected revenue, $E[R_b]$, from selling to blacks is:

$$[4] \qquad E[R_b] = Bp_b \int_0^1 x f_b(x; p_b, \mu_b)\,dx$$

where: B is the total number of blacks in the market.

The seller also perceives analogous conditions for selling to whites. The b's would be replaced by w's, B would be replaced by W, the total number of whites in the market, and x will be replaced by z, a proportion of the white population.

For now, we assume that the seller sees the vector μ as the same vector for both blacks and whites. Then expected total revenue, $E[R]$, may be written:

$$[5] \qquad E[R] = p_b B \int_0^1 x f_b(x; p_b, \mu)dx + p_w W \int_0^1 z f_w(z; p_w, \mu)dz$$

Next, we assume that costs are a linear function of sales made. Total costs will be given by:

$$[6] \qquad C = mS + a$$

where: m is marginal cost,
a is fixed costs, and
S is the number of sales made.

Due to the separability (additivity) of the cost function across buyer categories, expected total profits, $E[\pi]$, may thus be written as:

$$[7] \qquad E[\pi] = (p_b - m)B \int_0^1 x f_b(x; p_b, \mu)dx + (p_w - m)W \int_0^1 z f_w(z; p_w, \mu)dz - a$$

Maximizing this over p_b and p_w yields the first order conditions:

$$[8] \qquad B \int_0^1 x f_b(x; p_b, \mu)dx + (p_b - m)B \int_0^1 x \left\{[\partial f_b(x; p_b, \mu)]/(\partial p_b)\right\}dx = 0$$

$$[9] \qquad W \int_0^1 z f_w(z; p_w, \mu)dz + (p_w - m)W \int_0^1 z \left\{[\partial f_w(z; p_w, \mu)]/(\partial p_w)\right\}dz = 0$$

or alternatively from [8] we have:

$$[10] \qquad [(p_b - m)/p_b] = -\left\{(E_b[x \mid p_b, \mu])/p_b\right\} / \left\{\partial E_b[x \mid p_b, \mu]/\partial p_b\right\}$$

where: $E_b[x|p_b, \mu] = \int_0^1 x f_b(x; p_b, \mu)dx$, the expected demand given p_b.

But the right-hand side of [10] is just $-1/\eta_b$ where η_b is the elasticity (defined as a negative number) of the expected demand curve for blacks at the price p_b. This tells us two things. The first is that $(p_b - m)$ is strictly positive because p_b is positive and $-1/\eta_b$ is positive. *Price is always strictly above marginal costs.* Solving for p_b, at any given η_b, we have

$$[11] \qquad p_b = m/(1 + 1/\eta_b)$$

which looks like the standard certainty formula, cf. Ferguson [1969, p. 280]. This correspondence with the certainty formula is due to the linearity of the cost function and of expected profit maximization, i.e., risk neutrality. Similarly for sales to whites:

$$[12] \qquad p_w = m/(1 + 1/\eta_w)$$

If at any price level $p_b^* = p_w^*$ we have $\eta_b^* > \eta_w^*$ (or $|\eta_b^*| < |\eta_w^*|$), then if p_w^* is the optimal price to charge whites, the optimal price to charge blacks is higher.

The logic underlying the proposition that given at any price the elasticity of the expected demand curve for whites is greater is discussed in text (pp. 8-10) and follows from aggregation. The feedback mechanism will increase this differential in elasticities. Formally this would be entered into the model through the term μ. A similar process is demonstrated in more detail in Masson [1972].

The term a, fixed costs, enters into the profit calculations after solving for the first order conditions. This of course controls profitability and thus controls entry and controls (in part) the final number of firms in long run equilibrium.

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