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Consumer Differences and Prices in a Search Model

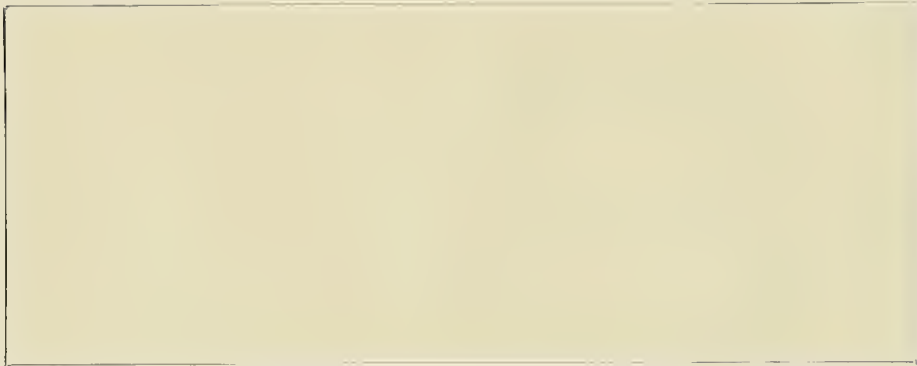
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Number 404

December 1985

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## CONSUMER DIFFERENCES AND PRICES IN A SEARCH MODEL\*

Peter Diamond

1. Introduction

Distributions of prices for homogeneous goods are widespread [Pratt, Wise, and Zeckhauser, 1979]. Yet in Walrasian theory all purchases of a homogeneous good occur at the same price. Search theorists have explored a variety of models having nondegenerate distributions of equilibrium prices. Among the models are ones where consumers differ in the cost per search [Axell, 1977; Rob, 1985], consumers differ ex post in the number of offers received [Butters, 1977; Burdett and Judd, 1983], and firms differ in costs [Reinganum, 1979]. Closest to this paper is the overlapping generations model of Salop and Stiglitz [1982] where young consumers are shopping for two periods while old consumers are shopping for one period if they bought only one unit in the previous period. Here, we explore a model where consumers differ in their willingness to pay for the single unit they are trying to buy.

With two classes of consumers, equilibrium can have a single price or a pair of prices. In a two price equilibrium, the lower price equals the lower willingness to pay of the two types of consumers, while the higher price is the reservation price of the type with higher willingness to pay. The price charged at high price stores increases and the fraction of low price stores decreases with the following changes in the exogenous parameters: an increase in the ratio of the flows of consumers with high willingness to pay to those with low willingness to pay, a

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decrease in the speed of search, an increase in the departure rate of consumers, an increase in the discount rate of consumers, a decrease in the willingness to pay of those with low willingness to pay, an increase in the willingness to pay of those with high willingness to pay. an increase in the marginal cost of production. An extension of the model to more general demand curves is briefly considered.

## II. Model Structure

There are two classes of consumers who differ only in the maximum amount they are willing to pay to purchase one unit of the consumer good sold in this market. We denote these willingnesses by  $u_1$  and  $u_2$  where  $u_1 < u_2$ . All consumers are assumed to maximize  $e^{-rt}(u_i - p)$  where  $p$  is the price paid and  $t$  the date of purchase. There are no explicit search costs except the delay factor from a later purchase.<sup>1</sup> The model is in continuous time with a unit flow of new consumers into the market. The ratio of the flow of those with high willingness to pay to those with low willingness to pay is denoted by  $g$ . When shopping, consumers experience a Poisson arrival of randomly selected sellers. The arrival rate is  $a$  per shopper, and is exogenous. In addition, there is a second Poisson process with arrival rate  $b$  per shopper which terminates search. If consumers of type  $i$  are willing to purchase in the fraction  $f_i$  of stores encountered, then in steady state the stock of shoppers of type  $i$  is equal to the flow times  $(af_i + b)^{-1}$ .

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<sup>1</sup>The delicacy of existence of equilibrium to this assumption is one reason for the more complicated demand structure discussed below. If there were a positive search cost, consumers would leave the market if they did not anticipate a strictly positive expected utility gain from actual purchase. With zero-one demand, consumers with the lowest willingness to pay have zero utility gain from a purchase. Thus the consumer surplus arising from a downward sloping demand would be needed to sustain an equilibrium with positive search costs.

No store will charge a price higher than  $u_2$ , the highest willingness to pay. In addition, in equilibrium no store will charge a price lower than  $u_1$ , the lowest willingness to pay. The argument for this conclusion is the same as that leading to the monopoly price with identical consumers [Diamond, 1971]. Because of search costs, the reservation price of any shopper strictly exceeds the minimal price in the market provided that price is strictly less than the shopper's willingness to pay. Therefore, if the lowest price in the market is less than  $u_1$ , the lowest price store can raise its price without losing any customers. Thus no prices are less than  $u_1$  in equilibrium. Therefore, consumers with low willingness to pay always have a zero level of expected utility.

Now consider the possibility of prices in excess of  $u_1$ . The only consumers who might purchase at such a price are those with willingness to pay  $u_2$ . These consumers are all the same. Their reservation price, denoted  $p_2^*$ , depends on the distribution of prices in the market. For a store charging a price above  $u_1$  but below  $p_2^*$ , a small increase in price loses no customers. Thus all stores with price above  $u_1$  charge exactly  $p_2^*$ .

Thus there are only three possible equilibria: all firms charging the price  $u_1$ , all firms charging the price  $p_2^*$ , and some firms charging each of these prices. If all firms charge  $p_2^*$ , then  $p_2^*$  is equal to  $u_2$ . We examine the two price equilibrium and then check for consistency as a way of discovering the parameters for which the other two cases hold. We denote by  $f$  the fraction of stores charging the lower price. Then those with low willingness to pay buy in the fraction  $f$  of encounters with stores; those with high willingness to pay buy in all stores that they encounter. Without any price reputations stores are free to choose any price. Thus, stores must make the same profit charging either of these



two prices. With a price  $p_2$  in high price stores, constant marginal costs  $c$  of sales ( $c < u_1$ ), and a fixed cost of being in business the equal profit condition is

$$(1) \quad (u_1 - c) \left( \frac{1}{af + b} + \frac{g}{a + b} \right) = (p_2 - c) \left( \frac{g}{a + b} \right) .$$

With free entry, the number of stores is determined by the zero profit condition given the flow of customers and the size of the fixed cost. Since  $a$  is taken as exogenous, the number of stores plays no role in the analysis provided it is large enough to justify the assumption of competitive behavior.

It remains to consider the cutoff price for consumers with high willingness to pay. We have the standard dynamic program formulation that the utility discount rate times the expected value of engaging in this process,  $V$ , is equal to the flow of possible capital gains. Since  $V$  equals the utility of a purchase just worth making,  $u_2 - p_2^*$ , possible capital gains occur from buying at a low price store at price  $u_1$  or from exiting. The former possibility arrives at rate  $af$  while the latter possibility arrives at rate  $b$ . Thus,  $V$  satisfies

$$(2) \quad rV = af(u_2 - u_1 - V) - bV .$$

Substituting  $u_2 - p_2^*$  for  $V$  and rearranging terms we have

$$(3) \quad u_2 = p_2^* + \left( \frac{af}{r + b + af} \right) (u_2 - u_1) .$$

Since  $p_2$  equals  $p_2^*$ , equations (1) and (3) give us two equations in the

two endogenous variables,  $f$  and  $p_2$ . These will represent an equilibrium provided that  $0 \leq f \leq 1$ .

As indicated above, we have assumed  $c < u_1 < u_2$ . Violations of the constraints that  $f$  lies in the unit interval correspond to the two types of single price equilibria. Solving equations (1) and (3) for  $f$ , we have

$$(4) \quad \frac{b+af}{r+b+af} = \frac{(u_1-c)(a+b)}{g(u_2-u_1)(r+b)} \equiv h,$$

where we have defined the right hand side of (4) to be  $h$ . A necessary condition for the two price equilibrium is that  $h$  satisfy the inequalities given in (5) corresponding to  $f$  lying between 0 and 1:

$$(5) \quad \frac{b}{r+b} \leq h \leq \frac{b+a}{r+b+a}.$$

If  $h$  is below these limits we have a single price equilibrium<sup>2</sup> at a price equal to  $u_2$ . If  $h$  is above these limits we have a single price equilibrium with the price equal to  $u_1$ . For given  $(a, b, r)$ , the fraction of stores with low price,  $f$ , is increasing in  $h$ , going from 0 to 1 as  $h$  varies in the interval in (5).

Rewriting (3), we can express  $p_2$  as

$$(6) \quad p_2 = \frac{(r+b)u_2 + afu_1}{r + b + af} = u_1 + (r+b)(u_2-u_1)(1-h)/r.$$

Thus  $p_2$  is a proper weighted average of  $u_1$  and  $u_2$  with endogenous

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<sup>2</sup>If  $b$  is equal to zero, there is no single price equilibrium with price equal to  $u_2$ .

weights. If we increase  $h$  by varying  $g$  or  $c$ ,  $f$  increases and so  $p_2$  decreases monotonically. As  $f$  rises from 0 to 1,  $p_2$  falls from  $u_2$  to a point between  $u_1$  and  $u_2$ . If we vary the other five exogenous variables, there is a direct impact on  $p_2$  as well as the indirect effect through  $f$ . Interestingly, it remains true that any parameter change that raises  $f$  lowers  $p_2$ .

### III. Comparative Statics

First, we note that  $h$ ,  $f$ , and  $p_2$  are homogeneous of degree zero in  $a$ ,  $b$ , and  $r$ , since this represents merely a change in the measurement of time. Similarly  $h$  and  $f$  are homogeneous of degree zero in  $c$ ,  $u_1$ , and  $u_2$ , while  $p_2$  is homogeneous of degree one in these three parameters. In Table I, we report the fourteen comparative static derivatives for the response of the two endogenous variables,  $f$  and  $p_2$  with respect to the seven exogenous parameters over the range where there is a two price equilibrium. Any signs in the table that are not directly observable can be confirmed by use of (5). We get an increase in the price charged at high price stores and a decrease in the fraction of low price stores with the following changes in the exogenous parameters: a decrease in the speed of search, an increase in the departure rate of consumers, an increase in the marginal cost of production, an increase in the ratio of the flows of consumers with high willingness to pay to those with low willingness to pay, an increase in the discount rate of consumers, a decrease in the willingness to pay of those with low willingness to pay, an increase in the willingness to pay of those with high willingness to pay.

To get some feeling for the comparative statics let us consider alternative equilibria as we increase the ratio of those with high

TABLE I

Comparative Static Partial Derivatives

	f	$p_z$
a	$\frac{(a+b)b(1-h)^2 + arh^2 - bhr(1-h)}{(a+b)a^2(1-h)^2} > 0$	$\frac{-(u_1 - c)}{rg} < 0$
b	$\frac{(r-a)rh - (1-h)^2(r+b)(b+a)}{a(1-h)^2(r+b)(b+a)} < 0$	$r^{-1}(u_2 - u_1) \left[ 1 - \frac{h(r+b)}{a+b} \right] > 0$
c	$\frac{-rh}{a(u_1 - c)(1-h)^2} < 0$	$\frac{a+b}{rg} > 0$
g	$\frac{-rh}{ag(1-h)^2} < 0$	$\frac{(u_1 - c)(a+b)}{rg^2} > 0$
r	$\frac{-hf}{(1-h)(r+b)} < 0$	$r^{-1}(u_2 - u_1) [1 - r^{-1}(r+b)(1-h)] > 0$
$u_1$	$\frac{(u_2 - c)hr}{a(u_1 - c)(u_2 - u_1)(1-h)^2} > 0$	$-\frac{a+b+bg}{rg} < 0$
$u_2$	$\frac{-hr}{a(u_2 - u_1)(1-h)^2} < 0$	$\frac{r+b}{r} > 0$



willingness to pay to those with low willingness to pay. At  $g = 0$ , we have a single price equilibrium with price equal to the reservation price  $u_1$ . As  $g$  increases from zero we simply have a change in the mix of customers purchasing. When there are enough customers with high willingness to pay, we have the emergence of stores specializing in selling to them. The willingness of shoppers to buy from these stores depends on the availability of low price stores. That is, the price in the high price stores is the reservation price of shoppers with high willingness to pay, not their maximum willingness to pay for the good. With further increases in  $g$  we get a relative increase in the demand for stores with high prices and so in their relative number. This means that any random draw from the set of stores has a higher probability of a high price rather than a low price. This raises the reservation price of those with high willingness to pay and so the price in high price stores. In order to maintain equal profitability the relative number of stores with high prices also increases. As  $g$  rises further, this latter effect eventually reaches the point that there are insufficient contacts from the entire stock of shoppers to support a single low price store. Therefore, we again have a single price equilibrium with the price now equal to the willingness to pay of those with high willingness to pay,  $u_2$ .

Since those with low willingness to pay always purchase at a price equal to their willingness to pay, their expected utility is zero for any combination of parameters. The parameters  $a$ ,  $b$ ,  $c$ ,  $g$ , and  $r$  affect only  $f$  and  $p_2$ . Thus, over the range of two price equilibria, the expected utility of those with high willingness to pay falls with decreases in the speed of search, increases in the departure rate, increases in the



marginal cost of the good, increases in the relative flow of those with high willingness to pay, and increases in the discount rate. A rise in  $u_1$  raises the price in low price stores while lowering the price in high price stores and raising the fraction of low price stores. The latter two terms predominate and expected utility of those with high willingness to pay,  $V$ , increases in  $u_1$  over the range of two price equilibria:  $\partial V/\partial u_1 = (a+b+bg)/rg$ . For low values of  $u_1$  there are only high price stores and  $V$  is zero.  $V$  rises with  $u_1$  through the range of two price equilibria. Once there are only low price stores,  $V$  falls with  $u_1$ .  $V$  is again zero when  $u_1$  is equal to  $u_2$ .

A rise in  $u_2$  raises the value of the good to consumers while raising its price in high price stores and lowering the fraction of low price stores. The latter terms predominate and  $V$  is decreasing in  $u_2$  over the range of two price equilibria:  $\partial V/\partial u_2 = -b/r$ . At  $u_2 = u_1$ ,  $V$  is zero. As  $u_2$  rises over the range of single price equilibria,  $V$  also rises. Once high price stores appear,  $V$  decreases with  $u_2$ , again reaching zero when the low price stores disappear from the market. It is interesting to note that the price at high price stores increases with maximal willingness to pay at a rate in excess of one,  $1+b/r$ . From (6) we see that the direct impact of an increase in  $u_2$  on  $p_2^*$ ,  $f$  held constant, is less than one,  $(r+b)/(r+b+af)$ . However, the rise in  $p_2$  makes high price stores more profitable than low price stores. This lowers the fraction of low price stores, further increasing  $p_2^*$ .

#### IV. Extension

We consider briefly an extension to more general demand, preserving the assumption that the entire purchase is made in a single store. We

assume two types of consumers, with higher profitability from selling to high demand consumers at any price. We assume that the two profitability of selling functions are quasiconcave and are strictly concave over the portion of the interval between the two profit maximizing prices where the functions are positive. The demand curve of low demanders reaches zero at a finite price which is less than the profit maximizing price for selling to high demanders. As above there can be one price or two price equilibria.

Assuming that all possible combinations of equilibrium price rules happen, we consider comparative statics of equilibrium as  $g$  varies. For low values of  $g$  we have a one price equilibrium where everyone is purchasing and price is increasing with the number of high demanders. At a critical value of  $g$  we have the appearance of high price stores selling only to high demanders. With further increases in  $g$  the fraction of low price stores falls, the price in high price stores rises while the price in low price stores falls. Once a sufficient level of  $g$  is reached, prices stop changing with  $g$ , but the fraction of low price stores continues to fall, until there are none left. Except in the second region described above (which need not exist), either prices are rising or the fraction of low price stores is falling, making it clear that consumers are worse off as  $g$  increases. In the second region, the rising price in high price stores equals the reservation price of high demanders. Thus high demanders are worse off, ex ante, the greater is  $g$ . For low demanders, prices at low price stores are falling, but such stores are becoming harder to find. This model is formally presented in the Appendix.

Appendix

We now derive the results stated in IV. We assume that the quantity demanded reaches zero at a critical price which we denote by  $\bar{p}_i$  for the two types of consumers.<sup>3</sup> We assume that the demand curves are sufficiently well behaved that the profitability of selling to each type of consumer is quasi-concave in price with the profit maximizing price for each type of consumer denoted by  $p_i'$ . We denote that profitability by  $\Pi_i(p)$  and assume that it is always at least as profitable to sell to an individual with high demand as to sell to an individual with low demand. In addition, we assume that the critical price  $\bar{p}_1$  and the profit maximizing price to type 1 consumers,  $p_1'$ , are less than the profit maximizing price to type 2 consumers,  $p_2'$ . We gather this notation and these assumptions in (7):

$$\begin{aligned} & \Pi_1(p) \leq \Pi_2(p) ; \\ (7) \quad & \Pi_i(p) = 0 \quad \text{for } p \geq \bar{p}_i ; \\ & p_i' \text{ maximizes } \Pi_i(p) ; \\ & c < p_1' < \bar{p}_1 < p_2' . \end{aligned}$$

In Figure 1, we show the configuration of the two types of profitability of sales functions. For convenience, we also assume that each of the profit functions is strictly concave between the values  $p_1'$  and  $p_2'$  for prices where each profit function is positive. The remaining assumptions are the same as above. In the analysis above,  $p_i'$  and  $\bar{p}_i$  coincided.

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<sup>3</sup>A similar analysis can be done for a discontinuous drop in demand to zero.

Here we assume they are strictly different.

We begin by exploring one price equilibrium. Let us denote by  $p'(f,g)$  the price that maximizes profits with a weighted average of demands:

$$(8) \quad p'(f,g) \text{ maximizes } \frac{\Pi_1(p)}{af+b} + \frac{g\Pi_2(p)}{a+b} .$$

Because of the kink in the profit function at  $\bar{p}_1$ , there are two possibilities for  $p'$ :  $p'$  might be strictly less than  $\bar{p}_1$  or strictly greater than  $\bar{p}_1$ . In the latter case,  $p'$  coincides with  $p'_2$ . While it is notationally convenient to write  $p'$  in terms of  $f$  and  $g$  separately,  $p'$  is increasing in  $g(af+b)$  where  $p'$  is less than  $\bar{p}_1$ . As we increase  $g$  from zero,  $p'$  rises from  $p'_1$  toward  $\bar{p}_1$  and then jumps discontinuously to  $p'_2$ . If we have a one price equilibrium, the price must equal  $p'(1,g)$ . For  $p'(1,g) < \bar{p}_1$ , both types are purchasing and there is necessarily a one price equilibrium. We have  $p'(1,g) < \bar{p}_1$  for  $g \leq g_1$ , where  $g_1$  satisfies

$$(9) \quad \begin{aligned} \text{Max} \quad & [\Pi_1(p) + g_1\Pi_2(p)] = g_1\Pi_2(p'_2) . \\ \text{p} & < \bar{p}_1 \end{aligned}$$

This is marked as region A in Table 2.

However, the range of values of  $g$  for which there is a one price equilibrium with everyone buying is wider than this if high demand customers are unwilling to buy at  $p'_2$  given the possibility of continued search for purchase at a price near  $p'$ . We analyze this case and that of two-price equilibria below after we consider the reservation price,  $p_2^*$ .

When we have a single price equilibrium at  $p'_2$ , low demand consumers



TABLE II  
Alternative Equilibria

Region:	A	C	D	E	B
Number of Prices	one	one	two	two	one
Price Levels	$p'$	$p_1''$	$p_1''$ $p_2^*$	$p_1''$ $p_2'$	$p_2'$
Value of $p'(1,g)$	$< \bar{p}_1$	$p_2'$	$p_2'$	$p_2'$	$p_2'$
Range of $g$	$[0, \varepsilon_1]$	$[\varepsilon_1, \varepsilon_3]$	$(\varepsilon_3, \varepsilon_4]$	$[\varepsilon_4, \varepsilon_2)$	$[\varepsilon_2, +\infty)$

are not purchasing. Thus they are available in greater numbers for a store that wants to enter at a price no greater than  $\bar{p}_1$ . Such a store will set price equal to  $p'(0,g)$ . We have a one price equilibrium at price  $p_2'$  when  $p'(0,g) = p_2'$ , for then entry as a low price store is not profitable. Thus we have such an equilibrium provided  $g \geq \varepsilon_2$ , where  $\varepsilon_2$  satisfies

$$(10) \quad \text{Max}_{p < \bar{p}_1} \left[ \frac{\Pi_1(p)}{b} + \frac{\varepsilon_2 \Pi_2(p)}{a+b} \right] = \frac{\varepsilon_2 \Pi_2(p_2')}{a+b} .$$

Note that  $\varepsilon_2$  is strictly larger than  $\varepsilon_1$ . We call this region B.

We turn next to the reservation price of high demand consumers.

Denoting the price charged in the low price stores by  $p_1$  and the utility

from a purchase net of payment by  $v_1(p)$ , we have the reservation price  $p_2^*$  satisfying

$$(11) \quad (r+b)v_2(p_2^*) = af(v_2(p_1) - v_2(p_2^*)) .$$

We write  $p_2^*(f, p_1)$  as the implicit solution to this equation.

We define  $p_1''(f, g)$  as the best price that does not exceed  $\bar{p}_1$ :

$$(12) \quad p_1''(f, g) \text{ maximizes } \frac{\Pi_1(p)}{af+b} + \frac{g\Pi_2(p)}{a+b} .$$

subject to  $p \leq \bar{p}_1$

When we have a two price equilibrium the low price stores charge  $p_1''$  and  $p_1'' < \bar{p}_1$ . Like  $p'$ ,  $p_1''$  depends on the product  $g(af+b)$ . Now let us examine equilibrium at the upper boundary of region A. When all stores are charging  $p''(1, g_1)$ , i.e.,  $f=1$ , the cutoff price  $p_2^*(1, p''(1, g_1))$  may be larger or smaller than  $p_2'$ . If it is larger, there is no further region of single price equilibrium. If it is smaller then there is a further region of single price equilibria, called region C. To determine the range of this region we define  $p_2''(f, g)$

$$(13) \quad p_2''(f, g) \equiv \text{Min}[p_2^*(f, p_1''(f, g)), p_2'] .$$

That is, when low price stores are charging  $p_1''(f, g)$ , high price stores will charge  $p_2''$ . The upper boundary of region C,  $g_3$ , is defined by the point where it is just profitable for entry of a firm specializing in high demand consumers

$$(14) \quad \underset{p \leq \bar{p}_1}{\text{Max}} [\Pi_1(p) + \varepsilon_3 \Pi_2(p)] = \varepsilon_3 \Pi_2(p_2'')$$

Since  $p_2'' \leq p_2'$ , we have  $\varepsilon_3 \geq \varepsilon_1$ . Comparison of (14) with (10) shows that  $\varepsilon_3 < \varepsilon_2$ . In the gap between  $\varepsilon_3$  and  $\varepsilon_2$  we have two price equilibria.

In order to have a two price equilibrium with equal profits at both stores, the high price stores must not be making any sales to the low demand consumers. Therefore, they are setting prices at the minimum of  $p_2'$  and  $p_2^*$ ; i.e., at  $p_2''$ . Low price stores are setting prices at  $p_1''(f, g)$ . The situation must be as shown in Figures 2 and 3. We have depicted the two different cases depending on whether the price charged in the high price stores is set at  $p_2^*$ , or at  $p_2'$ . We call these two regions D and E. When region C exists, we have two separate regions; when C does not exist, we have only region E. We assume that C does exist.

To complete the analysis we need the equal profit condition.

$$(15) \quad \frac{\Pi_1(p_1''(f, g))}{af+b} + \frac{\varepsilon \Pi_2(p_1''(f, g))}{a+b} = \frac{\varepsilon \Pi_2(p_2''(f, g))}{a+b} .$$

The borderline between the two types of two price equilibria occurs at the value  $\varepsilon_4$  which simultaneously solves (15) and has  $p_2^*(f, p_1'')$  equal to  $p_2'$ . Below we show that both regions are intervals and consider comparative statics.

For comparative statics, it is easiest to start with region E.

Here,  $p_2'' = p_2'$ . The equal profit condition, (15) can be written as

$$(16) \quad \underset{p \leq \bar{p}_1}{\text{Max}} \left[ \frac{a+b}{g(af+b)} \Pi_1(p) + \Pi_2(p) \right] = \Pi_2(p_2') .$$

Since  $\Pi_2(p_2')$  is independent of  $f$  and  $g$ , so too is the left hand side. Thus  $g(af+b)$ , and so  $p_1$ , are independent of  $g$  in region E. As  $g$  rises,  $f$  falls until  $f$  equals zero and we enter region B.

In region D, the equal profit condition becomes

$$(17) \quad \text{Max}_{p \leq \bar{p}_1} \left[ \frac{a+b}{g(af+b)} \Pi_1(p) + \Pi_2(p) \right] = \Pi_2(p_2) .$$

where  $p_2$  is equal to the reservation price,  $p_2^*(f, p_1)$  and  $p_1$  equals  $p_1'(f, g)$ . We argue that  $g(af+b)$  falls as  $g$  rises through this region. Thus  $p_2$  rises and  $p_1$  falls as  $g$  rises through this region. From (17) and the definitions of  $p_2^*(f, p_1)$  and  $p_1'(f, g)$ , we note that it is not possible for  $g(af+b)$  to have the same value for two different levels of  $g$ . If region D exists,  $p_2^* < p_2'$  at  $g_3$  and  $p_2^* > p_2'$  at  $g_2$ . Thus we have the claimed monotonicity.

Assuming regions C and D exist, we can now bring together the comparative statics of equilibrium as  $g$  varies. For low values of  $g$  we have a one price equilibrium where everyone is purchasing and price is increasing with the number of high demanders. For  $g$  sufficiently high, we have the appearance of high price stores selling only to high demanders. With further increases in  $g$  the fraction of low price stores falls, the price in high price stores rises while the price in low price stores falls. Once a sufficient level of  $g$  is reached, prices stop changing with  $g$ , but the fraction of low price stores continues to fall, until there are none left. Except in region D, either prices are rising or the fraction of low price stores is falling, making it clear that consumers are worse off. In region D, the rising price in high price stores equals the reservation price of high demanders. Thus high



demanders are worse off, ex ante, the greater is  $g$ . For low demanders, prices at low price stores are falling, but such stores are becoming harder to find.

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### References

- Axell, B. "Search Market Equilibrium," Scandinavian Journal of Economics, 79(1977) 20-40.
- Burdett, K. and K. Judd, "Equilibrium Price Dispersion," Econometrica, 51(1983) 955-969.
- Butters, G. "Equilibrium Distributions of Sales and Advertising Prices," Review of Economic Studies, 44(1977) 465-491.
- Diamond, P. "A Model of Price Adjustment," Journal of Economic Theory, 3(1971) 156-168.
- Pratt, J., D. Wise and R. Zeckhauser, "Price Differences in Almost Competitive Markets," Quarterly Journal of Economics, 93(1979) 189-212.
- Reinganum, J. "A Simple Model of Equilibrium Price," Journal of Political Economy, 87(1979) 851-858.
- Rob, R. "Equilibrium Price Distributions," Review of Economic Studies, 52(1985) 487-504.
- Salop, S. and J. Stiglitz, "A Theory of Sales: A Simple Model of Equilibrium Price Dispersion with Identical agents," American Economic Review, 72(1982) 1121-1130.

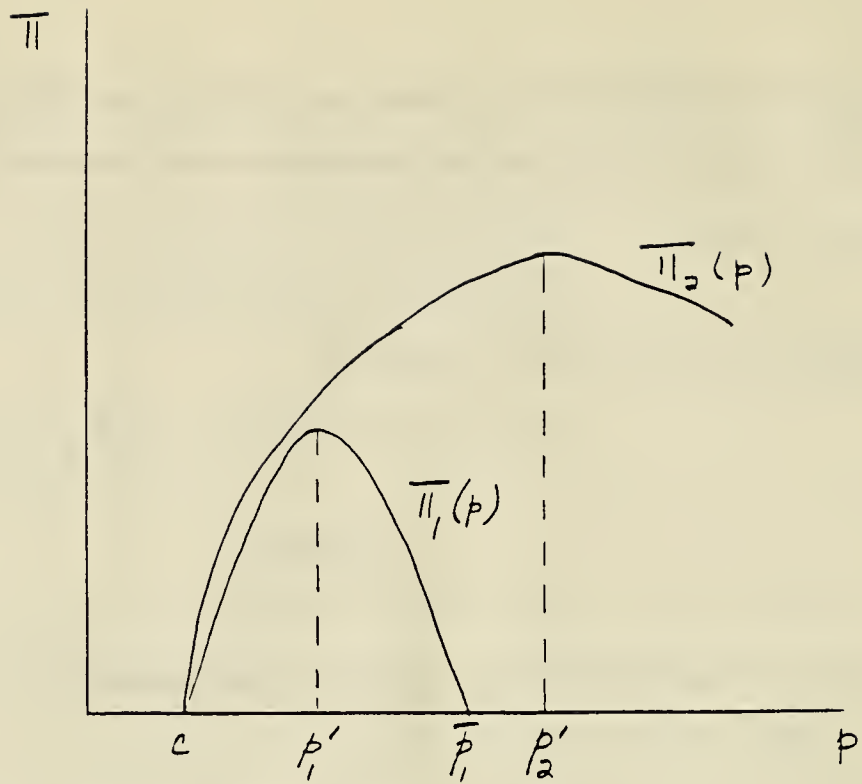
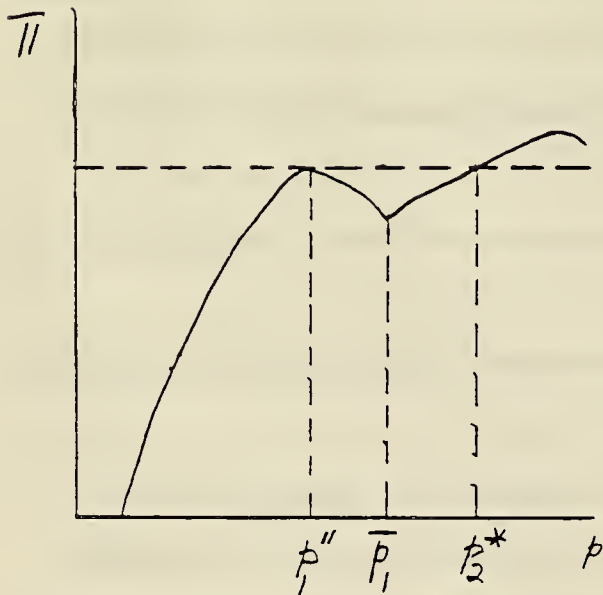


Figure 1



4353 Figure 2

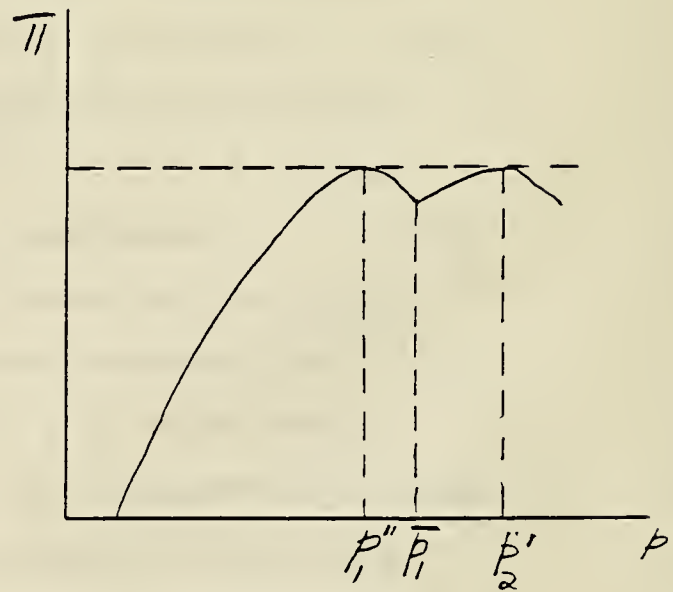


Figure 3

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