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DEMAND COMPLEMENTARITIES, HOUSEHOLD PRODUCTION, AND RETAIL ASSORTMENTS

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ABSTRACT

This paper presents a formal model of retail demand, based upon a household production framework, that permits rigorous analysis of retail assortments. The model captures the essential shifting of distribution costs between retailers and consumers that manifests itself in retailer's provision of distribution services for consumers. We apply the model to define rigorously conventional retailing concepts, such as assortment breadth and depth, and to explain the appearance of certain well-known phenomena such as leader pricing, non-price retail competition, and the incentives for retail agglomerations to form. We conclude the paper with some suggestions for future empirical work.

I. Introduction

The primary motivation for this paper might best be explained as an attempt to address formally the "assortment problem" in retailing. Why is it that one retailer may offer to his customers a choice of quantities of gasoline and groceries, while another may offer only gasoline, and still another only groceries? Apparently, the combination of these market goods (i.e. gasoline and groceries) into a retail assortment must be demanded by some customers sometimes; hence, the rise of what is often called "one-stop shopping."

But, almost all retailers provide "one stop shopping" to a greater or lesser degree. To wit, at the grocery store one can buy milk or bread or tomato soup or chicken or beef; at the service station one can buy gasoline (of various grades and types) or engine oil or replacement tires or batteries or automobile accessories. The fact of retail life is that the retailer provides, usually, a set of market goods, that is, an assortment of more than one market good. Within this set, some of the items may appear to be substitutes in consumption, some may appear to be complements in consumption, and some may be independent in terms of consumption. Yet in their desire for "one-stop shopping" consumers inevitably purchase baskets of market goods that may include substitutes, as well as goods that are independent in the conventional sense.

It is not, therefore, immediately obvious how the retail manager should assemble or modify his assortment, nor is it immediately obvious how one should formally represent the consumer's choice of a market basket that may include such goods as gasoline and milk, which are, hopefully, independent in terms of consumption though apparently complementary in terms of transacting with the marketing system.

We present in this paper a formal examination of the nature of retail demand that, we think, is a necessary step to permit further development of managerially relevant and usable retail assortment models. An interesting feature of our approach is that it is perfectly compatible with Bucklin's (1966) definition of the "product" of distribution as a mix of market goods in conjunction with an array of services resulting from the struggle to minimize costs among economic agents at adjacent levels in the marketing channel. Our formulation, moreover, permits a rigorous treatment of the shifting of distribution costs among retailers and consumers and comprehensive analysis of cross product effects in a retail setting.

This paper is organized as follows. In the next section we briefly review the relevant literature. We then present a formalization of the demand side of the retailer's operation that is based upon a household production framework wherein we elaborate a two-stage representation of the household's optimization problem. This formulation allows us to establish important properties of the demand functions and, in the process, to derive net as opposed to gross demand side relationships among items in the retail assortment. We close the paper with a consideration of the implications of the analytical results of the model for retailing theory and management, paying particular attention to the role of consumption activities of the household, the role of the non-market services of the retailer (distribution services), the presence of gross substitutes and the characteristics of traffic building items in the retail assortment, and the role of retail competition and agglomeration effects.

II. Review of the Literature

The rationale for the appearance of retail assortments has been eloquently argued by "classical" marketing scholars such as Alderson (1957),

who identified the discrepancy of assortments as the phenomenon driving the market equalization process. Alderson (1950) argued that the points at which assortments appear in the marketing system are determined by the principle of postponement. That is, the marketing system will delay the creation of an assortment to the last possible link in the channel. To Alderson's argument Bucklin (1963) later added a refinement: that the appearance of assortments in the marketing system is determined by the balance of the tendencies to delay (principle of postponement) and to risk (early) creation (principle of speculation) of an assortment. These arguments are useful as a first step in structuring one's thinking about the complex problem of assortment creation and modification within the marketing system, but these arguments are difficult to apply in a managerial sense.

A related stream of the marketing literature deals with the classification of goods and the classification of retailing. One can argue that certain types of retailers would put certain types of goods into their assortments. This is the logic of Aspinwall's (1958) system of red, orange, and yellow goods, for example. Yet there is no generally recognized classification system that can guide the retail manager to select items for inclusion in (or deletion from) an assortment on the basis of their demand or cost interdependencies.

In an early paper, Baumol and Ide (1956) presented a model of the demand for a retailer that was based on the countervailing influences of the consumer's desire to search the market and the full cost of searching. The prescriptive result is that retail assortments would not expand unchecked, even if there were no (supply) costs to doing so because beyond some point the cost of continued searching for the consumer is more to him than its benefits. The argument is appealing because it points to an essential aspect of the

shifting of (distribution) costs between the retailer and the consumer, but it does not explicitly model the interdependencies between items in the assortment.

Perhaps the most fruitful research tradition for the analysis of demand interdependencies among goods in the context of retail assortments is applied price theory. Several recent attempts to model aspects of product line pricing are presented in Moorthy (1984), Katz (1984), and Oren, Smith, and Wilson (1984). In each of these examples, items in the product line are assumed to be substitutes, such that the principal managerial issue is product cannibalization.

Retail assortments may indeed contain substitutes, but their principal characteristic in allowing "one-stop shopping" is to permit the consumer to purchase a basket of goods that are complements, at least in some sense. Telser (1979) analyzes the case of the multi-product monopolist who sells complementary goods, and creates different bundles of these goods for different market segments. Another relevant argument for the analysis of retail assortments is Preston's (1962) model of market basket pricing. The models of Telser and Preston, however, ignore an important additional aspect of retail assortments, namely, that they are collections of market goods and services and non-market services. The presence of the non-market services in the assortments, many of which patrons of the retail establishment cannot help but consume in a bundle with the market goods, and some of which patrons of the retail establishment consume even if they purchase no market goods, makes the retail manager's merchandising task all the more difficult.

In the next section of the paper we propose a formal explanation of retail demand that permits a rich analysis of the relatively complex

interdependencies within and between the market goods and services and non-market services in the retail assortment.

III. Formalization of Retail Demand

The consumer's patronage of retail establishments entails a variety of costs which usually can be shifted between the consumer and retailer, at least to some degree (cf. Bucklin (1966); Ingene (1984)). These costs can be experienced separately and jointly in any particular circumstance, and the actual form in which they are incurred can vary over place and time. Recognizing the existence of these costs, any given retailer can offer a variety of services in order to reduce the level of these costs borne by the consumer and, thereby, generate demand for his establishment. These services may be provided jointly or separately and, usually, these services will influence the levels of more than one distribution cost incurred by the consumer in his patronage of retailers. The form in which these services are provided may also vary across time and place. (We illustrate these costs and services in a later section of the paper.) As the retailer does not typically offer most of these distribution services to the market at explicit prices, many of these services constitute what we previously referred to as the "non-market" services of the retail assortment.

We formalize the demand for the market goods and services provided by the retailer by using the concept of household production developed in the economic literature by Becker (1965), Lancaster (1966) and Muth (1966). Briefly, we depict the representative household as producing a variety of outputs (denoted Z) that yield it satisfaction or utility. The Zs are produced under a household technology that uses among other inputs (1) "the household" time, (2) capital services from the fixed stock of durables available within the household, (3) market goods and services, and (4)

distribution services provided by the retailers it patronizes. Various environmental characteristics may also be relevant to the production process, such as the availability of electricity or refrigeration.

The optimization in which the household engages may be depicted as though it were to follow a two-stage process (Deaton and Muellbauer, 1980, pp. 245-254). For the analysis of the demand facing any given retailer, this decomposition of the optimization into two stages permits a useful interpretation of two categories of effects, namely, direct (household) production and (household) consumption effects (Betancourt and Gautschi (1987a)). As we shall demonstrate here in extending these results to the multiproduct case, it is only with respect to the direct production effect that the literature pertaining to the analysis of retail assortments has discussed cross product effects.

The first stage of the optimization can be described as follows:

$$\underset{Q}{\text{Min}}\ pQ \text{ s.t. } h(Q, D, Z) = 0 \qquad (1)$$

where Q is a vector of all the goods and services employed by the household in production, including the goods and services explicitly purchased from different retailers as well as the time employed by the household in production activities. p is a corresponding vector of prices, including the opportunity cost of the household's time. D is a vector of distribution services provided by the retailers which the household patronizes in its purchase activities. Z is the vector of commodities produced by the household, which are the ones that yield satisfaction or utility directly. h is a transformation function continuous and quasi-convex in its arguments.

The result of this optimization procedure is a cost function

$$C = C(p, D, Z) \tag{2}$$

that is nondecreasing, concave, and linear homogeneous in prices, increasing in outputs (the elements of Z), and non-increasing in distribution services (the elements of D). The last property follows from assuming that the distribution services provided by a retailer act as fixed inputs into the household production activities. It is in this manner that the shifting of distribution costs between households and retailers is captured formally in the model. It follows from Shephard's Lemma that the conditional (Hicksian) demand function for an item purchased from a particular retailer will be given by

$$Q_k = C_k = \partial C/\partial p_k = g_k(p, D, Z) \qquad k = 1,\ldots,K \tag{3}$$

In the second stage the household maximizes utility, by choosing the optimal levels of the commodities that yield satisfaction, subject to the constraint that the household's full income (W) be sufficient to cover the costs of producing these levels of the commodities. This second stage can be described as follows:

$$\text{Max } U(Z) \text{ s.t.} \quad W \geq C(p, D, Z) \ ,$$

where U(Z) is a quasi-concave utility function. The first-order conditions for an interior solution are given by

$$U_i(Z) = \lambda C_i(p, D, Z) \qquad i = 1,\ldots,I \tag{4}$$

$$W = C(p, D, Z) \ , \tag{5}$$

where $U_i = \partial U/\partial Z_i$, $C_i = \partial C/\partial Z_i$ and λ is the usual Lagrange multiplier. The solution of (4) and (5) yields the demand functions for the commodities, i.e.,

Gautschi, 1987b) that the sufficient conditions for $\Sigma\, \omega_{ki}\eta_{ik}$ to be non-positive are likely to be satisfied in the large majority of cases. Briefly, the sign of ω_{ki} depends on the sign of $\frac{\partial Q_k}{\partial Z_i}$ which will be non-negative (assuming that utilization of an input (Q_k) is either zero or increases with the production of an output (Z_i)). The sign of η_{ik} depends on the sign of $\partial Z_i/\partial P_k$ which will usually be non-positive (assuming that an increase in the price of an input (P_k) reduces the level of production of outputs (Z_i) that use the input (Q_k)). Even when the consumption effect is positive, it must be greater than the absolute value of the production effect in order to cause ϵ_{kk} to be non-negative.

The consumption effect plays an especially important role in the analysis of (demand side) relationships among different items in a retail assortment. From the Marshallian demand function in (7), we may derive the cross-price elasticity between two different items (k, ℓ) in the assortment as follows:

$$\epsilon_{k\ell} = \epsilon^{*}_{k\ell} + \sum_i \omega_{ki}\eta_{i\ell} \qquad (9)$$

Here again we have decomposed the effect on the demand for item k from a change in the price of item ℓ into a direct production effect $\epsilon^{*}_{k\ell} = \left(\frac{\partial Q_k}{\partial P_\ell}\middle| Z\right)\left(\frac{P_\ell}{Q_k}\right)$ and a consumption effect $\Sigma\, \omega_{ki}\eta_{i\ell} = \Sigma \left(\frac{\partial Q_k}{\partial Z_i}\frac{Z_i}{Q_k}\right)\left(\frac{\partial Z_i}{\partial P_\ell}\frac{P_\ell}{Z_i}\right)$. Equation (9) provides us with the grounds on which to present two important definitions.

Definition 1: Two items (k, ℓ) in an assortment are net substitutes, independent, or complements as the production effect ($\epsilon^{*}_{k\ell}$) is positive, zero, or negative, respectively.

Definition 2: Two items (k, ℓ) in an assortment are gross substitutes, independent, or complements as the sum ($\epsilon_{k\ell}$) of the production effect and the consumption effect ($\Sigma\, \omega_{ki}\eta_{i\ell}$) is positive, zero, or negative, respectively.

We note that it is with respect to the net effect of the first definition that the literature has formally addressed cross item relationships (e.g. Preston (1962)). Yet it is with respect to the gross effect of the second definition that relationships among items in complex assortments can be described. Invoking the example of gasoline and milk, as cited in the introduction to the paper, one can argue that these two items are net independents (i.e. the production effect is zero) but over some set of relevant consumption activities (Z), the consumption effect must be negative such that gasoline and milk are gross complements. If, for example, Z_1 is "having a picnic" and Z_2 is "driving in the country," then it is precisely because gasoline and milk are gross complements for (Z_1, Z_2) that a retailer would include both items in his assortment.

In our previous work (Betancourt and Gautschi, 1987b) we established the strong tendency for the consumption effect for any item with respect to a change in the price of another item to be negative. This is an important result as it reinforces the notion than assortments are assembled in order to permit "one-stop shopping," that the items in the consumer's market basket are complementary in some way. The negativity of the consumption effect is a force that drives all items in a retail assortment toward gross complementarity.

Given the tendency for items in a retail assortment to be gross complements, we now apply the decomposition of the cross price elasticity of equation (9) to define rigorously the two dimensions commonly used to describe retail assortments, namely, depth and breadth.

Definition 3: The extent to which items in a retail assortment are net substitutes is the depth of the assortment.

Definition 4: The extent to which items in a retail assortment are net independents is the breadth of the assortment.

Applying these definitions to any empirical situation will depend ultimately on how the set of consumption activities (Z) is defined. Before discussing the issues surrounding the application of these definitions, we consider formally another set of forces that binds the items of a retail assortment together as complements, namely, distribution services (D_j) provided by the retailer.

From the uncompensated demand function in (7), we can obtain the service elasticity of demand for any item in a particular retailer's assortment. Namely

$$\epsilon_{kj} = \epsilon^*_{kj} + \sum_i \omega_{ki}\eta_{ij} , \qquad \begin{matrix} k = 1,\ldots,K^* \\ j = 1,\ldots,J \end{matrix} \tag{10}$$

where $\epsilon_{kj} = (\partial Q_k/\partial D_j)(D_j/Q_k)$, $\epsilon^*_{kj} = (\partial Q_k/\partial D_J|Z)D_j/Q_k$, $\omega_{ki} = (\partial Q_k/\partial Z_i)\frac{Z_i}{Q_k}$ and $\eta_{ij} = (\partial Z_i/\partial D_j)D_j/Z_i$.

Equation (10) suggests the following definition.

Definition 5: A distribution service of a retailer and an item in this retailer's assortment that may be purchased by the household are net complements, independent or substitutes as the production effect (ϵ^*_{kj}) is positive, zero or negative, respectively.

This definition is consistent with Definition 1. The reason for the difference in sign is that here the elasticity is defined with respect to a change in a quantity rather than a price. For instance, in a conceptual experiment where the distribution service were offered by a retailer at an

explicit price (p_j), we would have: an increase in p_j decreasing D_j (by the concavity of the cost function), which in turn would imply a decrease in Q_k if Q_k and D_j are complements. Since the behavior of the restricted cost function must be consistent with the behavior of the unrestricted one, Definition 5 is consistent with this conceptual experiment. While one would expect the distribution services of a retailer normally to be net independent or complements with the items in the retailer's assortment that the household may purchase, net substitutability will also arise. Among the several distribution services offered by the retailer is assortment, itself, and the clearest example of net substitutability involving a distribution service is in the case of the depth of the assortment, as defined in Definition 3. If a retailer who sells one kind of meat, Q_k (hamburger), increases the depth of his assortment (D_j) by providing another kind of meat (lamb chops), households then have a greater range of choice. The result is that some households, at least, will now choose lamb chops instead of hamburger for given levels of the relevant consumption activities (dinner). That is, with manipulations of the depth of the assortment, ϵ^*_{kj} will be negative for at least some Q_k.

Equation (10) also suggests the following definition.

Definition 6: A distribution service of a retailer and any item in this retailer's assortment that may be purchased by the household are gross complements, independent or substitutes as the sum (ϵ_{kj}) of the production effect and the consumption effect is positive, zero or negative, respectively.

We have shown elsewhere (c.f. Betancourt and Gautschi, 1987b) that the distribution services provided by a retailer will tend to be gross complements with every item in the retailer's assortment that may be purchased by the household. Even in situations where an item (hamburger) and a distribution

service (depth of assortment) may be net substitutes, the consumption effect is likely to dominate the production effect. Thus, for example, increased depth may encourage the household to use a given item in the retailer's assortment as an input into more consumption activities (dinner, lunch, picnics, etc.).

We have established that gross complementarity between distribution services and items in a retail assortment is most likely to prevail when (a) the distribution service is a common (fixed) input in all the household production activities; (b) the percentage reduction in the household's costs as a result of an increase in the distribution service is large; (c) the consumption activities (Z) in which the items in the retail assortment are used have high marginal budget shares or high income elasticities of demand; (d) the items sold by the retailer constitute a small share in the household's budget. More generally, we note that those distribution services which have non-negative production effects with many items in a retail assortment, e.g., common distribution services (such as ambiance or accessibility of location), will be especially powerful sources of gross complementarity in the demand for retail products.

IV. Managerial Implications of the Household Production Formulation of Retail Demand

To illustrate the application to the retail environment of the analytical framework of the preceding section, we discuss four central issues that follow immediately from the model, namely, the role of consumption activities, the role of the distribution services, the appearance of gross substitutes in an assortment and the characteristics of traffic building products, and the role of competition and retail agglomerations.

A. The Role of Consumption Activities (Z)

As the demand for any item in the assortment of a retailer is derived from a more basic demand of the household for a consumption activity, it is the identification of Z that represents the most difficult task in the formulation of managerial strategy. This is not so new. In the tradition of Drucker (1954) and Levitt (1964) we know that it is not simply relevant, but that it is essential for the manager to ask himself occasionally "what market or business am I really in?" What is not so apparent is how the manager should ever begin to answer the question. In the context of the household production framework of the preceding section, it is apparent that the answer to the basic question of market definition for the retail manager should be structured, in large part, in terms of a response to another question, namely, "to which Zs do I cater?" That is, the retailer must identify among the many different possible aims of household production those that he intends to serve.

By determining which set of Zs to serve and for which household's, the retailer expresses his positioning objectives at a fairly general level. This suggests that different retailers selling items in the same general product categories may not be competitors because they each define the Zs that they serve in different ways.

We argue that it is the level of aggregation of the definition of the Zs that is key in establishing the distinctiveness of a retailer's positioning. For example, a supermarket and a delicatessen both sell food items. If the definition of the relevant consumption activity for these two retailers is so aggregated as "nutrition," then each retailer operates a "food store" and neither would be distinct from the other. Clearly, however, the delicatessen is a specialty food store, whereas the supermarket is a general food store.

The distinction follows from the fact that the assortment of the supermarket serves the needs of Z defined approximately as "nutrition from meals served at home," whereas the assortment of the delicatessen serves the needs of a restricted subset of Z that may include nutrition for specific types of occasions and for specific kinds of meals.

In general we argue that the degree to which a retailer is a specialist depends basically on the extent to which he disaggregates the consumption activities that he intends to serve. Conversely, a retailer is more of a generalist, the more he aggregates the relevant consumption activities he intends to serve.

It is important to recognize that this view of general merchants versus specialists does not require specialists to operate at small scales or generalists at large scales. There can be small-scale specialists, such as Foot Locker, a retailing firm that apparently caters to "foot care and protection for jogging and some other recreational sports"; there can be medium-scale specialists, such as Thom McCann, a retailing firm that apparently caters to "foot care and protection for recreation, social occasions, and work"; and there can be relatively large-scale specialists, such as Herman's World of Sports, a retailing firm that caters to "foot care and protection for jogging and some other recreational sports, care and protection of bones and vital organs for jogging and some other recreational sports, etc."

However, the depth and breadth of any retailer should be assessed only in the context of the set of Zs, at their appropriate levels of aggregation, that define the retailer's business. Both Foot Locker and Thom McCann carry shoes, many shoes. Whether Foot Locker has greater depth than Thom McCann depends on whether Foot Locker carries more net substitutes for each specific Z that it

serves as compared to the number of net substitutes Thom McCann carries for each specific Z that it serves. Similarly, the relative breadth of Foot Locker vis à vis Thom McCann depends on the number of items that are net independent for the relevant sets of Zs defining the businesses of these two retailers. Football shoes and running shoes are both used for sport, but they are no more net substitutes for the finely defined Zs to which Foot Locker caters than are ladies' pumps and workman's boots in the assortment of Thom McCann.

One could ask if a small-scale specialty retailer were to expand its business definition, what would be the most plausible way to expand? Consider the case of Foot Locker. The set of finely defined Zs which its assortment serves appears to be a subset of the Zs that define the business of Thom McCann and a subset of the Zs that define the business of Herman's. Given its original assortment (hence, given the original set of consumption activities it serves), would Foot Locker more naturally expand its assortment (thus, its set of Zs) to approximate that of Thom McCann's or that of Herman's? Although we cannot respond to the question unequivocally, we can observe that to expand the assortment of Foot Locker (i.e. to reposition Foot Locker) toward that of Thom McCann would result in the addition of items (other shoes) that are net independent with existing items in the Foot Locker assortment at a higher level of aggregation of the consumption activities served. But, to expand the Foot Locker assortment toward that of Herman's would mean adding items that are net complements with existing items at the same (low) level of aggregation of the consumption activities served. Thus, at least in terms of the selling effort required, repositioning Foot Locker toward Herman's would appear to be easier to accomplish than repositioning Foot Locker toward Thom McCann.

B. The Role of the Distribution Services (D_j)

If the definition of the relevant set of Zs at an appropriate level of aggregation is the most challenging aspect of retail management, the basic relationship to know on the demand side is the demand for Z. In reference to equation (6), one notes that the demand for any Z_i is a function of a host of arguments, namely, the prices of the items in the retailer's assortment and of items in the assortments of other retailers (p), the distribution services offered by the retailers (D), and other environmental variables. Thus, fundamentally, the distribution services provided by retailers in conjunction with the items in the retail assortment are the means with which the household achieves its consumption aims (i.e. Z).

The distribution services are means to the ends of household production because they are provided in order to reduce certain costs that the household incurs in interacting with the marketing system. We identify six categories of distribution costs in Table 1. These costs require little explanation except, perhaps, for psychic costs and adjustment costs. Psychic costs stem from what the consumer considers disagreeable in the retail environment, such as disagreeable social interactions, loud music, unpleasant odors, etc. Adjustment costs could result from a stockout or, generally, whenever the consumer must either substitute a different form for the exact form of the product that he desires, wait until the desired form is available or, possibly, travel to another retailer who has the exact form of the product he desires.

The distribution services that the retailer provides are also listed in Table 1.[1] Every retailer provides some level of each of these services, and any retailer can only produce non-zero levels of any of the services by deploying his resources (i.e. they are not free). A number of aspects of these services, as we have defined them, need to be emphasized. First, there

is not necessarily a one-to-one mapping from a given distribution service to any given distribution cost. For example, increasing the depth of assortment in a product category by stocking several package sizes of a product could reduce both adjustment and storage costs for the consumer. Secondly, some of the distribution services are produced jointly. For example, increasing the depth of an assortment also increases the assurance of product delivery, and, depending on the nature of the item, could improve the ambiance of the retail establishment. Third, some distribution services are common, meaning that the effect of altering a service, ambiance, for example, is distributed over all (or almost all) items in the retail assortment. Other distribution services are specific to certain items in the retail assortment, such as information on the specifications of a particular model of personal computer. Fourth, the five services identified are intended as general categories under which specific services may be classified. For example, liquidity cost is a form of adjustment cost as the retailer may find that in order to have an item purchased he would have to extend credit to his customers, thereby achieving high levels of assurance of product delivery at the desired time. Fifth, it is important to recognize that these categories of distribution services permit a fuller explanation of retail demand that can be rendered by general appeals to uncertainty or to the economics of information (Salop and Stiglitz, 1982). Finally, distribution services are most conveniently viewed as net complements with items in the retail assortment, but by definition most distribution services[2] are net substitutes for the household's time.

The linkage of consumption activities to the reluctance or willingness of households to incur distribution costs presents incentives for retailers to provide high or low levels of distribution services, respectively. We illustrate the association of the distribution services provided by retailers

to the manner in which consumption activities are defined in terms of Bucklin's (1963) method of retail classification. Briefly, Bucklin classifies retailing activities as specialty, convenience, or shopping stores depending on the nature of consumers' preference orderings for the items in an assortment before the act of patronage.

A specialty store is one that carries many net substitutes for a given Z defined at a low level of aggregation. Deviating from Bucklin's argument, we contend that the consumer does not necessarily seek or have a clear preference for a specific item in the assortment. The hallmark of the consumer who patronizes a specialty store is that he has clearly defined, highly disaggregated consumption (i.e. household production) objectives and, probably, desires low adjustment costs in purchasing the inputs. So the specialist responds by providing high levels of depth of assortment, i.e. many net substitutes for a given, highly disaggregated Z or set of Zs.

A convenience store is one that has an assortment for consumers who have clearly defined consumption objectives at relatively high levels of aggregation. The consumer who patronizes the convenience store is highly sensitive to adjustment costs associated with delay of product delivery for frequently purchased items. That is, the consumer who patronizes the convenience store demands high levels of assurance of product delivery at the desired time and is less demanding of product form. This consumer would be largely indifferent among net substitutes in the assortment that are suitable inputs for a highly aggregated Z. It is not surprising that convenience stores would be characterized as having little depth (shallow assortments). Convenience stores may also have assortments that are not extremely broad because the set of Zs for which consumers would value assurance of product delivery at the desired time more than the desired form is probably small. Hence, convenience

stores are likely to be characterized by shallow and moderately broad assortments, and they may tend to be small-scale, general merchants.

A shopping store is one that has an assortment that serves consumers who have vaguely defined consumption aims at high levels of aggregation. But the assortment of the shopping goods store differs from that of the convenience store because the consumer is most sensitive to information acquisition costs and to the adjustment costs of delay for infrequently purchased items. Moreover, as the consumer who patronizes this store is, by definition, unfamiliar with the extent of product choice in the market for a given Z and unfamiliar with prices of net substitutes, he or she is also likely to be sensitive to the adjustment costs of substitution and liquidity. Hence, the shopping good stores would tend to provide relatively high levels of assurance of product delivery in the desired form and at the desired time through high levels of depth of assortment (for highly aggregated Zs) and credit services, respectively. But the distinguishing feature of the shopping goods store is that it provides high levels of information for its generally uninformed clientele, who value the depth and breadth of an assortment that informs them efficiently of characteristics of a large set of market goods. The clientele of the shopping goods store also values other sources of information that the store provides by means of advertising and the distribution of catalogues, for example.

The application of our framework largely preserves Bucklin's earlier argument while elucidating the key roles that the distribution services play in distinguishing among different kinds of retailers. What relevant retailers provide in the way of distribution services depends essentially on how households value time in the pursuit of any given consumption activity. In particular, the trade-offs that households in general make between assurance

of product delivery in the desired form versus at the desired time have telling implications for the structure and evolution of retail institutions.

A simple example would suffice to illustrate the basic point. Consider the case of two retailers, a boulangerie (bakery) and a hypermarché, both selling bread.

Let Q : bread (baguette)

D_1 : assurance of product delivery in the desired form

D_2 : assurance of product delivery at the desired time.

The boulangerie produces high levels of Q and D_1 for the informed client. That is, the uninformed client is more likely to receive low levels of D_1, and possibly D_2, because he or she does not know precisely at what times during the day the boulanger brings his market good from the oven to the shelf. French bread that has been sitting on the shelf for several hours is generally regarded as being of low quality; that is, the form of the product deteriorates rather rapidly if it is not consumed shortly after production. The informed client may make two or three trips in a day to his favorite boulangerie to achieve high levels of D_1 for very disaggregated Zs (e.g. different meals in the day).

The boulangerie does not produce high levels of D_2. The hypermarché, on the other hand, produces high levels of D_2 and relatively high levels of Q for a more aggregated definition of Z (e.g. "meals," generally). The level of D_1 produced by the hypermarché is not likely to be so high as that for the boulangerie. Why? The hypermarché is not likely to produce all of the special types of bread that the boulangerie produces; and, more importantly, a loaf of bread produced at (or delivered to) the hypermarché is more likely to be older (even if by a matter of hours) than the loaf on the shelf at the boulangerie. But the hypermarché produces such high quantities of bread that

the household can almost always find a loaf on the shelf. Thus, the household has a choice:

EITHER

patronize the boulangerie and receive high assurance of product delivery in the desired form but possibly low levels of assurance of product delivery at the desired time (the household must adjust its patronage to the time of production at the retailer...failing to do so may mean that there would be no bread available at all);

OR

patronize the hypermarché and receive high assurance of product delivery at the desired time, but possibly low levels of product delivery in the desired form.

The household that makes the first choice would perhaps rather have a meal without bread than with stale bread...it "lives to eat." To this household the cost of adjusting the input "bread" for the consumption activity "a (specific) meal" may be so high that it would prefer to abstain from using a low quality input and would willingly incur the cost of adjusting the timing of its patronage to the timing of production of the input (i.e. bread from the boulangerie). The household that makes the second choice considers the cost of adjusting the timing of patronage too high and would willingly incur the cost of adjusting to a lower quality input (stale bread) for the consumption activity "meals (generally)"...it, perhaps, "eats to live." Because the household that chooses the first option values the form in which the product is delivered, whereas the second household values the time of the delivery, it is quite possible, ceteris paribus, that the first household would demand more bread (Q) than the second. Hence, the mix of distribution services could not only influence the shopping behavior of the household (i.e. whether the household patronizes a given retailer or not), but its consumption behavior as well (i.e. quantity of the input demanded).

This illustration of choice among different kinds of retailers highlights an important aspect of the demand for Zs. That is, the household can decide to provide itself higher or lower levels of different distribution services. Hence, for example, a reason for the rise of large-scale food stores in France (supermarchés and hypermarchés) and the attrition of traditional, small-scale food retailers is that the opportunity cost of time for the French household is rising with its income. This means that more and more French households now willingly incur relatively higher transportation, adjustment, information, and even psychic costs as compared to ten years ago in order to conserve time costs. The large scale retailers permit significant time savings for aggregated consumption activities through extensive assortments, credit, and central locations. Presumably, there are not as many French households now as before that demand traditionally high levels of assurance of product delivery in the desired form so that many small scale specialists have left the market. Because those households that have below average demands for assurance of product delivery in the desired form are more likely to be patrons of the supermarché, those specialist retailers (e.g. boulangeries) that remain cater to a customer base demanding a higher average standard of product form. The result is that competition among the small-scale retailers themselves could conceivably be fiercer now as compared to the level of competition when the supermarchés first emerged. This would only foster further structural change.

An additional consideration of the role of distribution services pertains to the relationship between the depth of the retail assortment (number of net substitutes for a given set of Zs) and the purchase interval of the household. If, for a given consumption activity, the purchase interval of the household spans several consumption occasions, then the retailer is encouraged to accumulate in the assortment a large number of net substitutes that may be

purchased as inputs for the consumption activity, generally. This demonstrates an essential aspect of the shifting of distribution costs between the household and the retailer. The household is willing to incur higher storage costs if the retailer provides greater assortment. This means that the household's market basket at any purchase occasion will likely increase with the retail assortment, and the number of purchase occasions will decline.

Finally, the distribution services that a retailer chooses to provide will depend upon the way he defines the consumption activities that he intends to serve. A generalist, such as J.C. Penney, caters to the household that desires "one-stop shopping" for an extensive set of fairly highly aggregated Zs. As such a household is likely to be interested in conserving time during the patronage activity, it may tend to demand less assistance from more personnel to adapt the form of products to its specific needs (i.e. low levels of assurance of product delivery in the desired form) and, generally, less information. Furthermore, to the extent that it demands high levels of assurance of product delivery in the desired form, it may be willing to achieve this by means of a catalogue order that requires waiting for delivery but conserves on time elapsed in the patronage activity. By contrast, a specialist, such as Foot Locker, assembles an assortment to serve the requirements of a restricted set of Zs that are highly disaggregated. The consumer who patronizes such a specialist is primarily interested in achieving high levels of assurance of product delivery in the desired form and information. Not surprisingly, such a specialist employs sales people who are generally knowledgeable of items in the assortment and who are expected to assist customers in making their choices. The possibilities for one-stop shopping are far more limited at the specialist.

C. Gross Substitutes and Traffic Building Products

In this section of the paper we address the conditions under which items in a given retail assortment can be gross substitutes; and we explore in some detail the case of items that are gross complements with many other items in the assortment, thereby serving as traffic builders.

By Definition 2 an item, k, is a gross substitute with other items in the assortment if $\epsilon_{k\ell} > 0$, for ℓ=1,...,L. Assuming, as usual, that the consumption effect is negative, it follows directly from equation (9) that an item can be a gross substitute for another item only if the net production effect dominates the consumption effect. This is most likely to occur for assortments that are extremely deep and not at all broad. An extreme case is that of a "pure" specialist who sells only two items, each used as an input in the same highly disaggregated consumption activity. Consider, for example, the pushcart vendor of apples and pears who appears on some corner of Wall Street during the lunch hour every Monday through Friday. This vendor may be said to cater to Z_i: light, non-fat, healthful nutrition for the quick midday meal. The typical pushcart customer may be the busy office worker who eats lunch on the run, procuring main dish (e.g. hot dog), drink (e.g. Coke), and dessert from various street vendors. So, for the pushcart vendor the cross price elasticity between the only two items in his assortment can be expressed as from equation (9) or

$$\epsilon_{k\ell} = \epsilon^{*}_{k\ell} + \omega_{ki}\eta_{i\ell}$$

In this case, for those customers with very inelastic demands for the commodity (Z_i) the consumption effect is likely to be small and as $\eta_{i\ell} \to 0$ gross substitutability will arise.

Other possibilities for the existence of gross substitutes in a given assortment may be analyzed in the context of a simplification of equation (9).

For ease of exposition, we assume that two items (k, ℓ) are net independent ($\epsilon^{*}_{k\ell} = 0$), and we express the consumption effect as (c.f. Betancourt and Gautschi, 1987b)

$$\sum_{n} \omega_{kn}\eta_{n\ell} = \sum_{n} \frac{\theta_n}{S_k} \left[\sum_{m} \rho^{*}_{nm}\pi_{m\ell} - S_\ell \eta_n\right] \qquad (9')$$

where θ_n is the marginal share of the household budget allocated to Z_n, S_k is the share of the household budget spent on item k, ρ^{*}_{nm} is the compensated cross-price elasticity of demand of Z_n with respect to a change in the shadow price of Z_m, $\pi_{m\ell}$ is the percentage change in the shadow price of commodity m as a result of a percentage change in the price of item ℓ, and η_n is the income elasticity of commodity n. Under the usual assumptions all elements in the expression on the right hand side of (9') are non-negative, except for ρ^{*}_{nm} which could be of any sign. Hence, when Z_n and Z_m are <u>substitutes</u>, two <u>items</u> in the retail assortment, (k, ℓ), are gross substitutes if $\sum_{m} \rho^{*}_{nm}\pi_{m\ell} > S_\ell \eta_n$ for given n. This condition is most likely to be fulfilled when S_ℓ is very small, denoting that item ℓ is of little importance to the household as it accounts for a negligible share of the household's budget. Finally, when $\eta_\ell < 0$ and Z_n and Z_m are substitutes, items k and ℓ would be gross substitutes. This case requires that the consumption activities be inferior goods, a phenomenon generally recognized as rare in economic theory.

To summarize, gross substitutes can arise in retail assortments but the necessary conditions for their existence are difficult to satisfy. To be sure gross substitutes are observed in retailing, but it would seem that they would be more characteristic of the combined assortments of different retailers than of the assortment of a single retailer.

It is more intuitive to think of items in a retail assortment as complements in some sense. In this regard, an issue that attends merchandis-

ing decisions is which items in an assortment should the retailer promote to generate patronage and, hopefully, encourage the representative consumer to consolidate his diverse (intended) purchases in pursuit of a given set of consumption activities (Z) in a single transaction with the retailer. Such product promotions often take place in the manner of what is commonly--if, perhaps, imprecisely--called "loss leader" pricing. Successful retailers apparently know intuitively which items in their assortments to use as loss leaders. Our purpose in this section is to present a formal analysis (for those with less intuition) that would reveal characteristics of items in an assortment that would be good candidates for loss leading.

In general the retailer will designate as loss leaders those items that are gross complements with many items in the assortment and that have high absolute values of the cross price elasticity ($\epsilon_{k\ell} < 0$). To establish the conditions for leader items, we consider three cases that span the range of possibilities.

Case 1. Two items used exclusively in the production of the same commodity, Z_n. In this case, equation (9') can be applied as follows:

$$\epsilon_{k\ell} = \epsilon^*_{k\ell} + \left(\frac{\theta_n}{S_k}\right)\left(\rho^*_{nn}\pi_{n\ell} - S_\ell\eta_n\right) \tag{9a'}$$

$$\epsilon_{\ell k} = \epsilon^*_{\ell k} + \left(\frac{\theta_n}{S_\ell}\right)\left(\rho^*_{nn}\pi_{nk} - S_k\eta_n\right) \tag{9b'}$$

Here, the item with the largest budget share (S) or that leads to the largest increase in the marginal cost of producing Z_n (π) will have the largest consumption effect. Hence, it is most likely to be gross complements with all other items used in production of Z_n. Moreover, if the commodity, Z_n, has the highest income elasticity (η_n), represents the largest marginal share of the household's budget (θ_n), and has the highest compensated own price elasticity of demand (ρ^*_{nn}), then the item will have the highest possible absolute value

of the cross-price elasticity among all the items that are gross complements and are used exclusively in the production of a single commodity.

Case 2. Two items (k, ℓ) used exclusively in the production of different commodities, respectively (n, m). The cross-price elasticities can be written as

$$\epsilon_{k\ell} = \epsilon^*_{k\ell} + (\theta_n/S_k)(\rho^*_{nm}\pi_{m\ell} - S_\ell\eta_n) \tag{9c'}$$

$$\epsilon_{\ell k} = \epsilon^*_{\ell k} + (\theta_m/S_\ell)(\rho^*_{mn}\pi_{n\ell} - S_k\eta_m) \tag{9d'}$$

If we assume that neither item (k, ℓ) is the source of any jointness in production, then it can be shown that $\epsilon^*_{k\ell} = 0 = \epsilon^*_{\ell k}\left(\frac{S_\ell}{S_k}\right)$. Using the symmetry of the compensated cross-price effects in consumption, $\rho^*_{mn} = \rho^*_{nm}(\theta_n/\theta_m)$, we have

$$\epsilon_{k\ell} = (\theta_n \rho^*_{nm} \pi_{m\ell} - S_\ell \theta_n \eta_n)/S_k$$

$$\epsilon_{\ell k} = (\theta_n \rho^*_{nm} \pi_{n\ell} - S_k \theta_m \eta_m)/S_\ell .$$

Given that any two items are used in the production of commodities that are net complements in consumption ($\rho^*_{nm} < 0$), the highest value of the cross-price elasticity of demand will be generated by that item which constitutes the largest percentage of the budget and makes the largest contribution to the marginal costs of the commodity in which it is used. This cross-price elasticity will be largest with respect to those other items that are used in the production of different commodities that constitute a large percentage of the budget and have a high income elasticity of demand.

Case 3. One item (ℓ) used in the production of every commodity and another item (k) used exclusively in the production of a single commodity (n). The cross-price elasticities can be written as

$$\epsilon_{k\ell} = \epsilon^*_{k\ell} + (\theta_n/S_k)\eta_{n\ell} = \epsilon^*_{k\ell} + (\theta_n/S_k)(\sum_s \rho^*_{ns}\,\pi^*_{ns}\,\pi_{s\ell} - S_\ell\,\eta_n) \qquad (9e')$$

$$\epsilon_{\ell k} = \epsilon^*_{\ell k} + \sum_i (\theta_i/S_\ell)\eta_{ik} = \epsilon^*_{k\ell}(S_k/S_\ell) - (S_k/S_\ell) \qquad (9f')$$

If the change in the price of the ℓ^{th} item increases the marginal costs of producing all commodities in the same proportion, ($\pi_{s\ell} = \pi$ for all s), then $\sum_s \rho^*_{ns}\,\pi_{s\ell} = \pi \sum_s \rho^*_{ns} = 0$ in (9e') because of the homogeneity of degree zero in prices of the compensated demand functions for commodities. With this assumption, the item used in the production of every commodity will have the largest (in absolute value) cross-price elasticity when its share of total costs is largest, assuming that the production effect is dominated by the consumption effect, and with respect to items used exclusively in the production of commodities with large marginal budget shares and high income elasticities of demand. Similarly, the item used exclusively in the production of a single commodity will have large absolute values of its cross-price elasticity, the larger its share in total costs. Interestingly, this will be the case even if the two items are substitutes in production, as long as the compensated cross-price elasticity ($\epsilon^*_{k\ell}$) is less than unity.

Recently, the literature on retailing has stressed what it calls "one way cross-price elasticity of demand," for example Albion (1983, p. 9). This notion in terms of our model is that the uncompensated cross-price elasticity of demand for an item is not symmetric ($\epsilon_{k\ell} \neq \epsilon_{\ell k}$) and that some items or products enjoy high values of these elasticities. Albion argues that products with these high elasticities are important because they act as traffic builders and that these high values for the elasticities are due to "product salience: the degree to which consumers notice and care about the terms of sale of a product" (p. 11). Subsequently, the example of meat and meat sauce, where meat has product salience, is mentioned (p. 103) without elaboration.

Our analysis provides various avenues in which "one-way cross-price elasticities" arise, as well as a way of identifying items or products having this characteristic that is more precise than an appeal to 'product salience'. To illustrate, consider the example of meat and meat sauce provided by Albion. Both of these items can be viewed as inputs used exclusively in the production of a commodity, a tasty (red) meal. Since meat constitutes a much larger share of the budget than meat sauce, and a change in its price increases the marginal costs of producing a tasty (red) meal substantially more than a change in the price of meat sauce, the analysis in Case 1 explains why meat has a much higher "one-way cross-price elasticity of demand" than meat sauce. Moreover, many of the other inputs used in the production of a tasty (red) meal, for example peppers, onions, salt, etc., can be viewed as inputs used in the production of every commodity or activity associated with the broad category nutrition-food. Therefore, the analysis in Case 3 is also applicable and once again meat will have a high one-way cross-price elasticity because it constitutes a large share of the budget for this broad category, whereas any of the other items will have a small share of the budget for this category. Finally, the analysis in Case 2 suggests that meat will also have a high "one-way cross-price elasticity of demand" with items used exclusively in the production of other commodities that are a large share of the food budget or have high income elasticities of demand, for example fresh shrimp or lobster in the production of tasty (white) meals. This is so because meat constitutes a large share of the food budget. In fact, it is this latter characteristic that contributes the most to meat being an excellent traffic builder, or to put it another way: an item's share in the consumer's budget is one of the main determinants of "product salience."

D. Retail Competition and Agglomeration Effects

Consider the situation of two retailers, A and B, where the items in the assortment of A would constitute a subset of the items in the assortment of B. What would be the influence on the demand for any given item in the assortment of A from a price reduction in an item in the assortment of B? Putting it another way: Can B adjust prices of certain items in his assortment so as to induce consumers to switch some or all of their patronage from A to B?

The most expedient way to investigate the effects of a price change in an item of one retailer on the patronage of another retailer is in terms of a slight modification of equation (9).

$$\epsilon_{k\ell}(A, B) = \epsilon^{*}_{k\ell}(A, B) + \sum_{i} \omega_{ki}(A)\eta_{i\ell}(B) \qquad (9")$$

If item k is Brand X in retailer A's assortment and item ℓ is Brand X in retailer B's assortment, it is entirely possible that reductions in the price of ℓ will not cause consumers to buy less of k. That is, even if k and ℓ are net substitutes, $\epsilon_{k\ell}(A, B)$ can still be non-positive because of the consumption effect where $\eta_{i\ell}(B) < 0$. The reduction of the price of the input ℓ from B reduces the total cost to the household of pursuing consumption activity Z_i. The household not only continues to use k from A, it could even increase its usage of k from A as a result of the decrease in the price of ℓ from B because as households increase their pursuit of Z_i the distribution services of retailer A continue to draw households to his store.

Thus, to analyze the nature of competition among retailers it is necessary to consider the influence of distribution services. We accomplish this by modifying slightly equation (10).

$$\epsilon_{kj}(A, B) = \epsilon^{*}_{kj}(A, B) + \sum_{i} \omega_{ki}(A)\eta_{ij}(B) \qquad (10')$$

If distribution service j from B is a common service, manipulations of its level will influence the demand for all items in the assortment of retailer B. Thus, if retailer B expands his parking facilities, households will be more inclined to buy more of all items in his store. What does this mean for the demand for items in the assortment of retailer A? The result depends fundamentally on whether items in the assortment of A are net complements, net substitutes, or net independent in relation to items in the assortment of B. If, for example, $\epsilon^{*}_{k\ell}(A, B) > 0$, for some k and ℓ, then $\epsilon^{*}_{kj}(A, B) < 0$ when j^{B} is a common distribution service. However, whether j from B is a gross complement with any k from A will ultimately depend on the strength of the consumption effect ($\Sigma\, \omega_{ki}(A)\eta_{ij}(B)$) which must be positive. If the consumption effect dominates the production effect [$\epsilon^{*}_{kj}(A, B)$] when k and ℓ are net substitutes or if k and ℓ are net complements or net independent, then increases in the levels of common distribution services provided by retailer B will increase the demand for items in the assortments of both retailers. That is, when distribution services of one retailer, j from B, are gross complements with items in the assortment of another retailer, k from A, there is a demand side incentive for the retailers to form an agglomeration.

Conversely, if a distribution service of one retailer is a gross substitute with items in the assortment of another retailer, then there is no demand side incentive for the two retailers to coexist in one agglomeration. In this situation the two retailers are clearly competitors. One should note that it is only possible for a common distribution service of one retailer to be a gross substitute with items in the assortment of another retailer if items in the assortments of the two retailers are net substitutes in production. Moreover, if common distribution services of, say, retailer B are gross substitutes with items in the assortment of retailer A, then retailer B

may also have a strong incentive to compete on price. That is, if the production effect in equation (9") dominates the consumption effect [$\Sigma\ \omega_{ki}(A)\eta_{i\ell}(B)$], then for repeated reductions in the price of ℓ from B, $\omega_{ki}(A)$ becomes smaller and smaller. In the limit $\omega_{ki}(A)$ approaches zero so that the consumption effect ceases to temper the forces toward substitution in the production effect [$\epsilon^{*}_{k\ell}(A, B)$]. Hence, when k in A and ℓ in B are gross substitutes, price leading of ℓ in B could eventually drive item k out of the assortment of retailer A, and this event would be hastened if retailer B simultaneously increased the levels of the common distribution services he or she provides.

The result of manipulating a <u>specific</u> distribution service has a weaker influence on the demand for items in the assortments of other retailers. Retailer B may increase the level of information for item ℓ in B by advertising. Intuitively, one should expect $\epsilon^{*}_{kj}(A, B)$ to be non-positive in this case, as the objective of the advertising is to draw patrons to retailer B to purchase item ℓ. But the consumption effect of (10') must still be <u>non-negative</u>, as increasing the level of information (j in B) reduces the cost of pursuing those consumption activities that use ℓ from B (or its substitutes) as an input.

An extreme, although not uncommon, case illustrates a free rider problem in the manipulation of a specific distribution service. Consider a situation where $\epsilon_{k\ell}(A, B) \approx 0$. For example, k in A could be a given model of a 35mm camera sold by retailer A, a mail order house; ℓ in B could be the same model of camera sold by a photographic equipment shop. If retailer B provides high levels of information on ℓ (via advertising, in-store demonstrations, documentation, etc.) a consumer can reduce his information acquisition costs and certain adjustment costs by, first, consuming the information services that retailer B provides to the market <u>at no explicit price</u> and, secondly,

purchasing the camera from retailer A who prices k in A significantly below ℓ in B in part because retailer A provides lower levels of most distribution services than does retailer B. Hence, increasing the levels of specific distribution services provided by one retailer can produce positive externalities for consumers who transact with other retailers.

V. Concluding Remarks

In this paper we have presented a formal model of retail demand that permits rich analysis of the composition of retail assortments. Using a rather conventional economic argument we have attempted to provide a rigorous representation of the nature of inter-item complementarity in retail assortments, and we have explored several important managerial implications stemming from this representation of inter-item complementarity. As we have demonstrated, the pervasiveness of gross complementarity among items in an assortment can be attributed to the dominance of the consumption effect over the production effect. The dominance of the consumption effect stems fundamentally from how items in the assortment are used by the household in its pursuit of various consumption activities, and it is the identification of relevant consumption activities at appropriate levels of aggregation that provides the clearest way for the retailer to define his market.

The model also incorporates the basic roles of various distribution services that the retailer provides to the household. By definition most distribution services are gross complements with items in the retailer's assortment. What is, perhaps, most interesting about the distribution services is that the manipulation of these services by the retailer does not influence the demand for items in other retailers' assortments in clearcut ways. We note, parenthetically, that the recent game theoretic applications

to retail competition and to conflict and coordination between retailers and their suppliers omit the fundamental role of distribution services.

The framework that we have presented in this paper suggests a number of potentially fruitful lines of empirical work. To be brief, we suggest three specific areas of empirical inquiry worthy of future investigation. First, the framework could be applied to analyze the productivity of retailing activities. Rather than using gross margins or retail margins, for example, as proxies for retail output, the framework suggests a set of retail outputs in the form of distribution services. Hence, one can explain much more about the actual functioning and performance of retail activities. For example, because a large scale discount store operates at lower retail margins than a small-scale, narrow-line specialist does not necessarily mean that the discounter is less productive than the specialist. Whereas the specialist may produce higher levels of some distribution services (e.g. information, ambiance, assurance of product delivery in desired form), the discounter may provide higher levels of other distribution services (e.g. accessibility of location, assortment, and assurance of product delivery at desired time). The challenge in the conduct of empirical productivity analyses is the development of reliable measures of these distribution services.

A second area of potentially interesting empirical work would be the analysis of cross-national or cross-regional differences among retail institutions. The framework could prove useful in answering questions pertaining to the tendencies toward large scale retailing in developed economies. Undoubtedly, institutional differences are a reflection, in part, of systematically different demands for distribution services emanating from the levels of distribution costs that households in different market environments are willing to incur.

A third area of potential empirical work is a temporal analysis of institutional change. We argue that this framework could be used to develop more rigorous explanations of the evolution of retailing in any given environment than those in the extant literature. Clearly, as an economy moves through stages of development, households revise systematically their valuation of time. As the valuation and usage of the household's time is central in determining the levels of most distribution services, the rising valuation of time in growing economies can only mean that households will demand more distribution services that conserve time. This process will be reflected in institutional change.

TABLE 1

Distribution-related Costs	Distribution Services
Adjustment costs	Product Assortment
	Accessibility of Location
Direct transportation costs	Ambiance
Direct time costs	Assurance of product delivery in desired form at desired time
Storage costs	Availability of information
Information acquisition costs	
Psychic costs	

FOOTNOTES

1. For illustrations of the distribution costs and services, see Betancourt and Gautschi, 1987c.

2. Ambiance, for example, is not necessarily related to time.

REFERENCES

Albion, M. (1983) Advertising Hidden Effects: Manufacturer's Advertising and Retail Pricing, Boston: Auburn House Publishing, Inc.

Alderson, W. (1950) "Marketing Efficiency and the Principle of Postponement," Cost and Profit Outlook, vol. IV, no. 3 (September).

_____ (1957) Marketing Behavior and Executive Action, Homewood, Ill.: R.D. Irwin.

Aspinwall, L. (1958) "Characteristics of Goods and Parallel Systems Theories," in E. Kelley and W. Lazer (eds.) Managerial Marketing, Homewood, Ill.: R.D. Irwin, pp. 434-450.

Baumol, W. and W. Ide. (1956) "Variety in Retailing," Management Science, vol. 3, no. 1 (October), pp. 93-101.

Becker, G.S. (1965) "A Theory of the Allocation of Time," Economic Journal, 75 (September), pp. 493-517.

Betancourt, R. and D. Gautschi. (1987a) "The Economics of Retail Firms," Managerial and Decision Economics, forthcoming.

_____ (1987b) "The Demand for Retail Products and the Household Production Model: New Views on Complementarity and Substitutability," working paper.

_____ (1987c) "The Evolution of Retailing: A Suggested Economic Interpretation," International Journal of Research in Marketing, 3 (April), pp. 217-232.

Bucklin, L.P. (1963) "Retail Strategy and the Classification of Consumer Goods," Journal of Marketing, 27, no. 1, pp. 50-58.

_____ (1965) "Postponement, Speculation, and the Structure of Distribution Channels," Journal of Marketing Research, 2, pp. 26-31.

_____ (1966) A Theory of Distribution Channel Structure, Berkeley: Institute of Business and Economic Research, University of California.

Deaton, A. and J. Muellbauer. (1980) Economics and Consumer Behavior, Cambridge: Cambridge University Press.

Drucker, P. (1954) The Practice of Management, New York: Harper and Brothers, Inc.

Ingene, C. (1984) "Productivity and Functional Shifting in Spatial Retailing: Private and Social Perspectives," Journal of Retailing, 60 (Fall), pp. 15-36.

Katz, M. (1984) "Firm Specific Differentiation and Competition Among Multiproduct Firms," Journal of Business, 57, no. 1, part 2, S149-S160.

Lancaster, K. (1966) "A New Approach to Consumer Theory," Journal of Political Economy, 74 (April), pp. 132-57.

Levitt, T. (1964) "Marketing Myopia" in Modern Marketing Strategy, E. Bursk and J. Chapman (eds.), Cambridge, Mass.: Harvard University Press.

Moorthy, S. (1984) "Market Segmentation, Self-Selection, and Product Line Design," Market Science, vol. 3, no. 4 (Fall), pp. 288-307.

Muth, R. (1966) "Household Production and Consumer Demand Functions," Econometrica, 34 (July), pp. 699-708.

Oren, S., S. Smith, and R. Wilson. (1984) "Pricing a Product Line," Journal of Business, 57, no. 1, part 2, S73-S100.

Preston, L. (1962) "Markups, Leaders, and Discrimination in Retail Pricing," Journal of Farm Economics, 44 (May), pp. 291-302.

Salop, S. and J. Stiglitz. (1982) "A Theory of Sales: A Simple Model of Equilibrium Price Dispersion with Identical Agents," American Economic Review, LXXII, pp. 1121-1130.

Telser, L. (1979) "A Theory of Monopoly of Complementary Goods," Journal of Business, 52, no. 2, pp. 211-230.

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