Supermarket Shopping Adoption
and the Modernization of Food Retailing:
Theory, Method and Application

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Abstract

The study of food retail modernization is especially relevant at this time, given the recent expansion of multinational food retailers into emerging economies, particularly Asia. We review previous research on the transition of food retailing from traditional systems to modern ones dominated by supermarkets, and integrate differing accounts of the process of supermarket adoption into a parsimonious framework. Three separate phenomena comprise this framework: spatial diffusion, socio-economic diffusion, and product category-dependent diffusion. We propose a method based on consumers' food shopping behavior, which allows us to quantify the impact of each of these processes in limiting supermarket market share at a point in time in any specific retail system. We demonstrate our method by analyzing the state of modernization of the food retail system of Hong Kong, and find that product category-dependent diffusion is the major restriction to further supermarket expansion in Hong Kong. We discuss the ways in which our framework and method could be generalized to study other retail situations where retail formats or classes of formats compete for market share.
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The growing globalization of the business environment makes the process of the displacement of traditional, small-scale family-owned food stores by large supermarkets an extremely important issue for both consumer goods manufacturers and retailers. This process has been labeled as food retail modernization (Savitt 1988, Slater and Riley 1969). Both international and local supermarket companies carry out food retail modernization. As to international, a growing number of supermarket operators, are expanding beyond their national boundaries, often into developing countries, especially in South America, Eastern Europe and Asia. Table 1 depicts the present state in multinational presence of food retailers in Asia. Supermarket companies like Tengelmann, Ahold and Carrefour are already deriving about half of their revenues from international operations (Business Week, 1997). Carrefour, for example, opened its first hypermarket in Asia in 1989 (Taiwan) and now operates 47 stores in 8 Asian countries (Kuipers, 1999). French, German, Dutch, Belgian, UK, Japanese, Singapore, Hong Kong, South African and Thai supermarket companies are very active internationally (Sternquist 1998, Reuling 1999). While U.S. companies lag behind, retailers such as Wal-Mart, Kmart and Price-Costco have been expanding internationally, mostly into developing countries, with the super center and warehouse club formats (Business Week, 1997; Brauer 1998). Large local supermarket companies lead the food retail modernization process in China, Hong Kong and Singapore and have visible presence in other Asian countries. Recent cases of difficulties in Asia (such as the withdrawal of Wal-Mart from its Value Club joint venture in Hong Kong, Park N Shop from Taiwan and Yaohan from China) highlight the importance of understanding the processes driving food retail modernization.

Table 1 about here

We make two contributions in this paper. Our first is theoretical. It involves the integration of previous work on the process underlying food retail modernization into a comprehensive theoretical framework. The process of supermarkets displacing traditional
formats\textsuperscript{1} is reflected in the supermarket's growing share of food sales. We identify and analyze three separate processes driving this development: spatial diffusion of supermarket outlets, socio-economic diffusion of supermarket use, and diffusion of supermarket use by product category. Our framework identifies key managerial decision variables and environmental factors that may affect each of these three processes.

Our second contribution is methodological-managerial. The three processes involve interactions between firm and consumer decisions, suggesting that a thorough analysis of the state of a retailing system should involve quantitative surveys of both firms and consumers. Acquiring the information necessary for quantitative analysis from firms, however, engenders formidable difficulties due to data confidentiality and the large numbers of businesses (with associated data incompatibilities) that would need to be surveyed. We propose a simple method to disentangle these three processes based only on a consumer survey. In our particular application, we use a hierarchical series of discrete choice models of consumer shopping behavior to assess the state of each of the three processes at a particular point in time and to quantify the extent to which they constrain supermarket's market share in a particular retailing situation. The analysis may also be used to identify ways of increasing (or slowing) the pace of food retail modernization.

While our framework is specifically developed in the context of food retail modernization, it is generalizable to other retail situations where different retail formats compete by offering overlapping assortments. The three diffusion processes, their relation to market shares, their expression and measurement in terms of consumer shopping behavior, and their implications for retailers' fundamental decisions of locations, socio-economic target markets, and assortment, are common to all these retailing contexts. For example, at present in the U.S.A., super centers draw share from the supermarket format, and general merchandise discount stores compete with the category-killer format. Similarly, the framework and method we propose could easily be extended to analyze retail market structure in any modernization situation where modern retail formats replace traditional ones. Our current substantive interest, however, is in the modernization of food retailing systems, and the competition between modern and traditional formats.

\textsuperscript{1} By "traditional formats," we are referring to small, independent, family-owned retailers including a variety of formats such as independent grocery stores, bakeries, stall operators in vegetable markets, etc.
We rely on a rich literature on the development of the supermarket format and on food retail modernization, including conceptual work analyzing the challenges facing supermarkets in gaining acceptance in both developed and developing countries (Appel 1972; Goldman 1975/76; Kaynak and Cavusgil 1982; Findlay et al. 1990; Samiee 1990; Savitt 1990; Zimmerman 1955) and work describing food shopping patterns in different regions (Dannhaeuser 1984; Guerion 1964; Ho and Lau 1988; Lau and Lee 1988; Miossec 1990; Othman 1990; Slater and Riley 1969; Yavas et al. 1981; Zain and Rejab 1989).

In the long run, the framework and methodology we develop in this research should be robust enough to be used in a wide variety of environments and, with repeated application, to allow formal comparisons across countries and over time. The main aim of the research reported here is to demonstrate the method's usefulness by applying it in one known environment at one point in time. We apply it in the Special Administrative Region of Hong Kong, where supermarkets were introduced over thirty years ago. Hong Kong is a particularly interesting setting because, while it has a well-developed economy, a strong traditional food retailing sector continues to flourish, so that supermarkets account for only 40% of food purchases (Ho et al. 1994). This contrasts sharply with the situation in developed Western economies, where supermarkets were able to gain dominance of food retailing in a comparable length of time. What are the factors limiting supermarket growth in Hong Kong? Our framework and methodology clearly show that most of the opportunity for further growth lies in perishables, and is an example of product category limitations to further diffusion of a retail format.

While some of the elements in Hong Kong's environment are unique, it does share features such as high population density, Asian cuisine, strong preference for fresh foods and frequent consumer shopping with other countries in the region. These commonalities may justify extrapolating from the findings in Hong Kong to these countries, to predict the likely course of retail modernization in the region.

THEORETICAL FRAMEWORK

A simple aggregate measure of the state of food retail modernization is the market share of food retail sales captured by supermarkets. By itself, however, share provides little information of value to decision-makers on the format's evolution. The literature on food retail modernization, in contrast, provides a good starting point because it examines the underlying factors leading to the success, or otherwise, of the supermarket format. We
summarize this literature by identifying three types of phenomena, which drive the process of supermarket growth. The first is spatial diffusion, the process of increasing supermarket accessibility to consumers by increasing the number of supermarket outlets. Spatial diffusion is driven by increased revenues which result from reducing customer travel times and hence transportation costs, and, all else equal, should continue until the additional revenues do not justify the costs of opening an additional outlet. A demand-side upper limit to spatial diffusion occurs when transportation costs no longer deter any customers in the region from shopping at some supermarket. The second phenomenon, which we refer to as socio-economic diffusion, is the process in which supermarkets are sequentially adopted by different socioeconomic classes. The typical model assumes supermarkets are first adopted by higher socio-economic class shoppers who find the characteristics of the modern format (one-stop shopping, large assortments, shopping atmosphere) most appealing. In a particular context, there may be several reasons why supermarkets appeal more to higher socio-economic groups. On the functional-economic side, two factors dominate. The first is higher opportunity cost of shopping time, which makes multi-stop shopping at several traditional formats more costly for higher socio-economic groups. The second reason is that higher socio-economic households tend to have better facilities to transport and store large quantities of food, which makes one-stop shopping more feasible for them than for lower socio-economic groups. In addition, larger variety and the status conveyed by shopping in the modern supermarkets may also be a factor. Socio-economic diffusion is complete when all socio-economic groups regularly shop at supermarkets. A third phenomenon which may limit supermarket share growth is that consumers may partially adopt the supermarket format, shopping there regularly, but only for a subset of product categories. This pattern may reflect supermarket’s weaknesses or the continued strength of traditional retailers in some important product areas. Typically, supermarkets are first most successful with packaged non-perishable product categories but are weak in perishables. Later, they may successfully expand to these categories. We label this process category-dependent diffusion.

Previous work on food retail modernization has focused on one or more of these factors, and has described situations that may be viewed as case examples of particular combinations and sequences of these three processes. For example, if socio-economic groups are spatially separated, socio-economic diffusion is likely to parallel spatial diffusion. In this case, we observe supermarkets first opening in high income areas, and later in lower income areas. This scenario was first described by researchers studying food retail
modernization in Latin America (e.g. Galbraith and Holton 1965; Slater and Riley 1969, Slater, 1970). It led to concerted efforts by retail modernization agencies to accelerate the socioeconomic diffusion by opening supermarkets in lower income areas of the less developed countries (LDCs).

Where there is no clear spatial separation of socio-economic groups, as is the case of many Asian cities, socio-economic diffusion could lag spatial diffusion. We would observe supermarkets becoming widely accessible, but not being used by a socio-economic group of customers who do not value the format's features enough to shop there. A number of studies have reported cases in developing economies of such supermarket "failure." Supermarkets have become widely available, but many consumers, in spite of being within a supermarket's trade area, do not adopt supermarket shopping, and continue to buy all of their food and grocery items in the traditional retail formats (Bucklin 1976; Goldman 1981; Guerion 1964: FAO 1973A; FAO 1973B; Kaynak 1985). This has been labeled as a "dual" modernization process because it fits the general "dual" economy approach to modernization (Dholakia and Sherry 1987; Joy and Ross 1989; Wood and Vittel 1986), which emphasizes the mutual exclusivity of traditional and modern systems.

Early explanations of this "supermarket failure" phenomenon were based on the diffusion of innovations research tradition. Researchers first attributed it to consumers' "inertia," "habits" and the difficulties consumers have in adjusting to the self-service environment, with the implication that this was essentially a short-term communication problem, which would disappear with time. Other researchers realized, however, that the reasons for supermarkets' failure reflect more fundamental, and long-term, consumer-related factors. The consumer decision was modeled in cost-benefit terms; a consumer switches from traditional stores to the new supermarket format when benefits from switching outweigh costs (Goldman 1981). One-stop shopping saves consumers shopping time costs. Supermarkets will therefore be more favored by consumers who wish to shop less frequently. These will tend to be higher socio-economic class consumers, who have a higher opportunity cost of time, and more storage space and transportation options. Indeed, it is well known that LDC consumers,

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2 Consistent with this argument, Messinger and Narasimhan (1997) developed a one-stop shopping model based on consumers economizing on shopping time, and showed that increasing per capita disposable income, and better consumer storage and transportation technology, have been the two dominant reasons behind the increase in the size and assortment of food retailing outlets in the U.S. between 1961 and 1986.
with fewer resources compared to consumers in developed countries, do, in fact, shop very frequently for food and groceries (often once a day) and buy small amounts in each transaction (Galbraith and Holton 1965; Goldman 1974; Samiee 1993; Slater and Riley 1969; Yavas et al. 1981). Furthermore, it may well be that some service and social advantages of the traditional outlets, such as credit, personal attention and social interaction, are more valued by lower income groups (Slater and Riley 1969). In summary, socio-economic diffusion may arise from either inertia differentials or from cost-benefit differentials across socio-economic classes.

A factor largely ignored in early work on modernization was that consumers do not switch completely from traditional to modern formats. Rather--as researchers soon recognized—they switch sequentially by product category, so that category-dependent diffusion typically lags the previous processes. The use of supermarkets only for selected product categories, or “selective adoption” (Goldman 1982) has been documented in a number of retail environments in the developing countries (e.g. see Othman 1990). These studies identified fresh food products (vegetables, fruits, meats, fish) as being regularly purchased in traditional outlets, while processed and packaged foods are bought in supermarkets.

The reasons for the initial failure of supermarkets in LDCs to compete effectively in perishable categories could reside in both demand and supply side factors. On the demand side, supermarkets emphasize self-service, prepackaging, product standardization, and mass merchandising and their appeal to LDC consumers is based on variety, quality, shopping environment and price. In contrast, the traditional perishable outlets use counter-service, and allow consumers the flexibility of selecting the amounts and qualities they require. The lack of refrigeration and limited space results in daily disposal of stale foods and frequent deliveries of fresh supplies and, when small retailers are concentrated in open markets, collectively they may offer a high variety in products, quality and service levels. Consequently, consumers may perceive traditional outlets to offer fresher produce and meats, and better service, quality and variety than supermarkets. On the supply-side, uncertainties in quality and availability, and the fragmented nature of agricultural production and distribution may make it difficult for supermarkets to achieve cost and quality advantages over traditional outlets. They may overcome these difficulties by establishing direct relationships with suppliers and investing heavily in supply chain infrastructures, including processing, transportation and storage

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3 Furthermore, in some regions of the world, “fresh” meat and fish connotes “warm,” implying freshly killed. Therefore refrigerated meats, as offered by supermarkets, are not perceived to be fresh.
facilities. However, these activities, even when feasible, further raise costs. Furthermore, investment in training, in-store facilities and equipment to handle perishables more effectively is required. In these situations supermarkets become high cost operators who are unable to offer the quality and prices found in the traditional retail system.

The experience of the early supermarkets in the U.S. is relevant in our context since they faced similar difficulties in integrating perishable food lines into their assortment. The analysis of the historical developments of supermarkets in the U.S. shows that the first supermarkets offered mostly packaged and processed food items and only a limited selection in perishables. Many of the early U.S. supermarkets, for example, did not, at first, sell fresh meats (Appel 1972; Goldman 1975/96; Markin 1963; Zimmerman 1955). Similarly, in the 1970s, supermarkets in Germany and France accounted for only some 30 percent of the fruit and vegetable sales, while specialized stores, open markets and street vendors dominated retailing in these areas. Until the supply-side infrastructure required by the supermarket format was in place, traditional retailers offered superior variety, quality and service in perishables, at lower prices.

In a study related to our work, Keng and Ehrenberg (1984) looked at differences in category purchases across formats in England. Their eight format units would be classified as “modern” by our criteria—six different store chains and two groupings of stores (“independent” and “miscellaneous”). They found that a chain’s “penetration” (defined as the percentage of a city’s population that shops at a chain in a particular time period) is closely related to market share of a particular product category. Their product categories were all packaged goods with long shelf-lifes, such as instant coffee, canned dogfood, and detergent. Thus, in this setting at least, customers did not discriminate among modern formats when purchasing nonperishable goods. This result provides some support for treating packaged nonperishable goods as a single category and modern formats as a single format. Our research extends Keng and Ehrenberg’s work to include traditional formats and perishable goods.

Implications of the Three Processes

The three phenomena described above could each limit, individually or collectively, supermarkets’ share of food purchases in an area. We aim to determine the relative
contribution of each at a specific point in time. Such knowledge is likely to help food retail managers — traditional or modern, domestic or international — to develop appropriate strategies and tactics, and enable policy makers to monitor and influence the entire food retail system. We focus in this paper on the perspective of supermarket management and discuss the relative importance of each process in limiting supermarket market share. Note that the three processes map directly into retailing strategies as the processes relate to the basic three main ways in which a supermarket can increase share: by opening (or acquiring) more outlets, by attracting new socio-economic segments of shoppers to existing outlets, and by capturing a larger proportion of consumers' expenditures on food items through the increase in the number of categories of goods purchased by existing customers. Implications for traditional retailers and public policy makers can be similarly drawn.

Among the three processes, spatial diffusion is the simplest and most basic. If it is the dominant factor limiting supermarket growth, the recommended strategy is simply that of opening more outlets until it is no longer profitable to do so. The upper limit on this process, when no further share gains are possible due to opening additional outlets, is the point where supermarkets are sufficiently accessible that the difference in customer transportation costs between it and the traditional outlet is no longer an important deterrent to supermarket use. Managers' options are much more limited when socio-economic diffusion is the major constraining factor, as further diffusion depends on increasing consumer storage space, transportation options and opportunity cost of time. These processes are a function of long term developments such as increasing income and proportion of women employed in the work force (Arndt 1972). Monitoring socio-economic trends will help managers to decide on appropriate times and locations at which to open new outlets. An alternate strategy would be to increase the attractiveness of the supermarket format to traditional outlet shoppers by such

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4 Primary transportation costs incurred by shoppers are the opportunity cost of travel time and actual expenditures such as gasoline or public transit fares. For a given household, variability in these costs across different grocery outlets is dependent on travel times to the outlets, so that travel time differences among competing outlets are the relevant consumer-side measure of the extent of spatial diffusion of one type of outlet.

5 Following from the preceding footnote, two households with the same travel time differences among competing outlets may make different format choices because of different relative sensitivities to storage, transportation, time, and other costs. This variability in sensitivities across households is most directly related to socio-economic factors, such as car ownership.
means as developing smaller supermarket formats that can locate closer to consumers, smaller package sizes and free delivery. If category dependent diffusion limits the level of supermarket share, further market share gains depend on penetrating the limiting product categories. If these are fresh perishable products, managers can respond by developing the supply chain infrastructures, in-store facilities and operational skills required to handle fresh items efficiently. They can also influence consumers’ perceptions regarding freshness, quality, variety, service and price, focusing for example on a few image building items in this category and adopting the atmosphere and service features of traditional retailers. Finally, supermarkets may benefit, in this case too, from the same consumer trends as in the socioeconomic diffusion case. Rising incomes and an increase in the proportion of working women may lead consumers to weight differently the supermarket advantages (one-stop shopping, atmosphere) vs. those associated with shopping in traditional outlets.

Table 2 summarizes the framework, highlighting the differences among the three processes.

Table 2 about here

THE MODERNIZATION PROCESS AND SHOPPING BEHAVIOR

Our objective is to measure the relative contribution of each of the three diffusion processes to supermarket market share employing a method that is simple, fast and easy to use. Other researchers (e.g. Arnold, Oum and Tigert 1982) used consumer cross shopping data to study retail food store choice in a number of developed countries. While their research was motivated by different goals (identifying the important attributes in grocery store choice rather than determining the processes by which one format replaces another), they did find that within modern formats, location, price, assortment, fast checkout, friendly and courteous service, weekly specials and pleasant shopping environment are critical determinants of patronage. These “marketing mix” variables can be related (although not perfectly mapped) to our typology of the components of market share in the following way: location decisions affect spatial diffusion; assortment decisions affect product category diffusion; and price, service, and ambience variables affect socio-economic diffusion. We also follow their example in using consumer survey data as our central method. We therefore
require a clear understanding of the relation between consumer shopping behavior and the retail company’s decisions, which ultimately affect the state of the food retailing system. We view this interface in the context of a household production process (Becker 1965) which takes retail distribution services as an input into utility-producing activities of the household. Combining the household production perspective with notion that the “product” of distribution is a mix of market goods and a range of distribution services (see, for example, Bucklin, 1966) leads to a framework that has been used to analyze a wide range of retail problems. Betancourt and Gautschi (1986) provide a rigorous explanation of the evolution of retail formats by showing how the demand for retailers’ goods depends on the relations between household production costs, particularly the opportunity cost of household labor, and distribution services, subject to environmental constraints such as storage space and demographics. In another paper (Betancourt and Gautschi, 1990), they study the interaction between retail assortments and distribution services, and derive explicit implications of the fact that most distribution services are net substitutes for the household’s time. Hoch et al (1995) use the household production approach in empirical work to help select demographic variables that should impact on consumer price sensitivity. Messinger and Narasimhan (1997) appeal to this framework to develop and test a model of grocery shopping that explains the rise of supermarkets in the U.S. in terms of the increased value of one-stop shopping as wages, and hence opportunity costs of time, have increased. We follow these authors by identifying variables whose impact on consumers’ format choice can be related to the state of each of the three processes. We then estimate three logit models of the food retail format choice, (modern or traditional) generated by progressively adding the variables to a base model. Our main measure of the contribution of each process to market share is the improvement of fit, as measured by incremental $R^2$, and predictive “hit rate” generated by the addition of the set of variables associated with that process. We next describe the constructs and tests in general terms. In the subsequent application, we provide the details of our particular operationalization.

**Spatial Diffusion**

Locational product availability is a distribution service that reduces household transportation costs by reducing travel times. Incomplete spatial diffusion of outlets as a limitation on supermarket market share can be viewed, from the household perspective, as travel costs limiting supermarket patronage for at least some consumers. The impact of travel
time on format choice between supermarkets and traditional formats across the entire market is therefore a good consumer-side measure of the overall level of spatial diffusion of supermarkets. For example, if there is no observed relation between format choice and travel time differences to competing formats, opening more outlets can produce no further gains in market share, and spatial diffusion is effectively complete. Hence, if incomplete spatial diffusion is limiting supermarket market share, then we should expect:

**Hypothesis 1 (incomplete spatial diffusion):** The greater the travel time to the traditional outlet, relative to the supermarket, the greater the probability of purchasing at the supermarket.

**Socio-economic diffusion**

A socio-economic limitation to market share implies that format choice is influenced by socio-economic class. Betancourt and Gautschi (1986) note that “...one reason for the rise of large-scale food stores (supermarkets and hypermarkets) in France is that the opportunity cost of time for the French household is rising with its income...moreover, the shifting of storage costs for time costs within the household... has further hastened structural changes in French retailing.” In their conclusions, they state that, “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.” Messinger and Narasimhan (1997) also demonstrate that household opportunity costs, storage costs, and transportation costs have been central drivers of grocery format evolution in the United States. Since we have already considered the component of transportation costs associated with travel times, we focus on the remaining two factors. Specifically, only households with 1) a sufficiently high opportunity cost for time, and / or 2) the ability to transport and store sufficiently large quantities of food will shop at supermarkets. Other consumers tend to buy their food needs in the traditional outlets. The impact on format choice of these two factors is a measure of the impact of socio-economic limitations. If incomplete socio-economic diffusion is limiting supermarket market share, then we should expect

**Hypothesis 2a (incomplete socio-economic diffusion a):** A higher opportunity cost of time is positively related to the probability of shopping at supermarkets.
Hypothesis 2b (incomplete socio-economic diffusion b): The ability to purchase in large quantities is positively related to the probability of shopping at supermarkets.

Product Category Dependent Diffusion

When individual consumers shop at both supermarkets and traditional outlets, but consistently purchase different items at the different formats, then supermarket market share is limited by incomplete product category diffusion. While different product categories may be involved, in the particular context of food retailing modernization, as we have previously discussed, a highly relevant limiting category is perishable goods. This category is extremely important from a managerial perspective as fresh produce, meats and fish capture a significant proportion (around a third) of supermarkets’ grocery sales in the developed countries and their contribution to profitability is even higher. In addition, the quality of these items is a major contributor to supermarket image and an important choice determinant (Brooks 1995). Consumers may concentrate perishable purchases at the traditional stores and non-perishables at the supermarket. If incomplete category dependent diffusion, specifically for perishables, is limiting supermarket market share, then

Hypothesis 3 (incomplete category dependent diffusion): Consumers’ probability of shopping for a product at supermarkets is greater if the product is nonperishable than if it is perishable.

Diagnosing the Status of Format Penetration

As described in the empirical application later in this paper, our approach is not to just test these hypotheses for statistical significance. Rather, we attempt to explain aggregate behavior in terms of these three individual sets of hypotheses, and to estimate the relative contribution of each of the three sets in explaining aggregate behavior at a particular point in time. Our interest is in understanding the driving factors behind the choice of different formats for different product categories. We thus model household format choice at the product level, and include sets of independent variables that are related to these three diffusion processes.
In different retailing contexts, different product categories may be more relevant and different combinations of these three sets of variables may account for variance explained. Our methodological approach, described in detail in the Hong Kong application, clarifies a way of parsing the “total variance explained” in household level format choice into these three components. Table 3 summarizes implications which may be drawn about the state of food retailing modernization based on whether each of these hypotheses is accepted or rejected. In particular applications, the results will also suggest specific follow-up analyses that generate additional insights. When, for example, two or three hypotheses are accepted, it is important to determine the relative contribution of each (in the application, we use a hierarchical series of models to address this issue). Another example noted in Table 3 is that when both socio-economic and spatial limitations exist, it is useful to determine if the two factors are correlated or not.

Before describing our application, it might be useful to distinguish our approach from store choice models (e.g. Arnold, Oum and Tigert 1983). Store choice models typically have the objective of determining the relative importance of elements of the retail marketing mix to consumers. The method is to examine the magnitude and significance of coefficients in a household level choice model, where the dependent variable is store choice, and the independent variables are the relevant mix elements. This is very different from our objective, which is to break down the penetration of a particular format, in a market which contains more than one format, into three components using only a consumer survey. Further, as will be clearer in the specifics of our application, our method involves a hierarchical set of models, and our interest is in examining the incremental contribution to fit of each of the three diffusion processes. Finally, since our theory explicitly considers tradeoffs among household characteristics and distribution services, we use different types of variables (the dependent variable is household purchase of a particular item at a particular
format, and, of all our independent variables, only one could be considered a mix element).

Indeed, our model may be considered complementary to a store choice model, as limitations on each of the three components suggest attention to specific elements of the retail mix. For example if a format were unable to attract “high” socio-economic groups, management might reasonably consider improving store atmosphere, and adding time-saving services such as delivery. If a format were unable to attract “low” socio-economic groups, they might reasonably consider reducing services to reduce price and making products available in smaller units.

Table 3 about here

APPLICATION: FOOD RETAILING IN HONG KONG

Our framework provides a relatively easy method to diagnose the state of food retailing across different environments and at different times because it can be implemented with a consumer survey. The next step is testing it in a familiar environment which is well understood, much as any remote sensing tool needs to be calibrated in an area where we have “ground truth.” Hong Kong provides such an environment. It is a particularly interesting place to apply our framework, as it has all the characteristics of an advanced and developed economy, yet its food retailing system is not dominated by supermarkets. Supermarkets were introduced into Hong Kong in the early 1960's. Today, some 600 supermarkets serve a population of six million, giving a per capita level of supermarkets similar to that in other Western countries (Ho et al. 1988; 1994; Kawahara et al. 1994; Lau et al. 1988; Mun 1974). Gross domestic product (GDP) per capita also compares favorably to highly developed Western countries. The population is well educated, displays a high propensity for adopting innovations and enjoys a high standard of living (Howlett 1996; Hong Kong Annual Digest of Statistics 1995). Many modern shopping centers, department stores, and specialty stores serve Hong Kong’s consumers (Kawahara et al. 1994; McGoldrick et al. 1992; Philips et al. 1992). Despite these factors, all of which point to a sophisticated retailing environment, supermarkets have captured only a 40 percent market share of all food and grocery purchases. A variety of
traditional food retail formats such as wet markets, Chinese grocery stores, and various specialty stores (bakeries, frozen, Chinese foods etc.) (Ho et al. 1994) account for the majority of food and grocery sales. This contrasts sharply with the situation in Western economies. In countries such as the U.S.A., Canada, U.K., Germany and France the supermarket format needed 25-30 years to attain a dominant position in the food retailing system, accounting for 70-80 percent of total food sales. Judged on economic and social indicators, Hong Kong belongs to the developed world. Its food retail system, however, resembles those found in developing countries. What limits supermarkets’ market share growth? An answer to this question is the first step in addressing relevant managerial questions: what can supermarket managers do to increase their market share, or conversely, how can traditional retailers defend their share?

We next describe an application of our tripartite framework to analyze the factors limiting market share of supermarkets in Hong Kong.

**Method**

In-depth interviews with a purposive sample of primary food shoppers were conducted prior to the main study to enumerate the important product categories purchased, and to identify the types of retail outlets in which food was purchased. On this basis, sixteen product categories, including five fresh perishables (meat, fish, fruits, vegetables, and bread), and eleven non-perishables (noodles, soft drinks and juices, oil, canned food, “salty” food, biscuits, rice, spices and sauces, tea, frozen food and alcoholic beverages) were selected for the study. Note that there is a clear separation in storage lifetimes between the two lists of goods. The list classified as “nonperishable” could be stored on the order of months (rice, for example is purchased on average once per month), while the “perishables” list would, at most, last days (meat and fish, for example, are normally consumed on the day of purchase in Hong Kong). To reduce the list to a manageable length for the main survey study, it was split into two lists of eight categories each, the two lists being balanced in terms of inclusion of perishables and non-perishables, daily necessities and non-staples. The sample was also

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6 meat, fish and vegetables preserved by salting and drying

7 cookies and crackers
randomly split, and each half was asked about purchase of the categories in one of these two lists. The food outlets were initially classified in the analysis stage as either “modern” outlets (including the two leading supermarket chains, independent supermarkets, food sections of major department stores, convenience store chains, drugstore chains and warehouse clubs) or as “traditional” outlets (including wet markets, Chinese grocery stores, bakeries, fruit shops, and tea stores). Since 99% of the reported purchases in modern outlets were in the two leading supermarket chains, we later restricted the analysis to purchases in these supermarkets.

We recognize that the term “supermarket” covers a wide variety of sub-formats including, among others, small conventional supermarkets, traditional supermarkets, limited-line supermarkets, superstores, warehouse club stores, super centers, and hypermarkets. As these vary in size, assortment composition and the emphasis given to various product categories, it was important to ascertain the format profile of the Hong Kong’s supermarkets. This is relevant for two reasons. First, if sub-formats vary in their emphasis on perishables, the category at the center of this study, then product category diffusion is not dependent on consumers’ adoption decisions and reflects management’s strategy. Second, if sub-formats exist, the question of interest for management may become that of the diffusion of the main sub-formats rather than an assessment of the state of “supermarkets” in general.

We checked the situation in Hong Kong through a series of personal interviews with the managing directors and senior managers (buying and operations) of the two supermarket chains which, together, operate some 450 supermarket and account for over 75 percent of supermarket sales there, and managers of two of the four smaller chains. We found a large degree of homogeneity. All the chains operated a small (an average store size of 700 square meters, 7,000–9,000 Skus, for the two chains, and smaller stores for the others), neighborhood, conventional, supermarket format. All stores carried an assortment of the relevant fresh food lines (vegetables, fruits, chicken, pork) but as we will discuss later, the assortment was slightly weaker than wet markets in quality and price. A few larger

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8 “Wet” markets are located inside every housing estate (typically a large group of multi-storied buildings) and in central areas of the various Hong Kong districts. Most of them are roofed and enclosed and only a few are street markets. There are some 300 such markets in Hong Kong. Each contains scores of small stalls specializing in vegetables, fruits, meat, fish and seafood and Chinese foods. Some of the markets are managed by the Government, some by the housing estate management, and some by private companies.
(4,000–5000 square meters) "superstore" formats have been opened in Hong Kong since 1996 but these did not exist at the time our study was conducted (1995).

A stratified\(^9\) random sample of 382 households was selected from the telephone directory. Trained interviewers working under close supervision administered the questionnaire on the telephone to the primary food shopper in each sampled household. The interviews were conducted during a two week period in January 1995. The survey consisted entirely of closed-ended questions including frequency of shopping at various types of outlets, travel time to these outlets, location where each of the food items was purchased and demographic and socio-economic variables. The interviews lasted between 15 and 45 minutes each, with the majority around twenty minutes. Interview times varied due to the varying number of outlets used by shoppers, and the amount of probing required.

A subsequent analysis revealed that the frequency distribution of the sample in the 19 districts of Hong Kong closely matched the population distribution. Also, the average monthly household income of the sample (HK $22,900) matched the population average (approximately HK $22,600)\(^10\). We conclude that our sample was representative of the population.

**Descriptive Statistics**

Respondents averaged 43 years of age, enjoyed a monthly household income of HK$22,900 (approximately US $2,960) and lived in an apartment of size 553 square feet with three other household members. On average, two members in each sampled household held full time jobs. The reported average weekly food expenditure (excluding the cost of meals not prepared at home) was HK$ 1006 (approximately US $130). Twenty percent of the sampled households owned a car, and 12.3% employed a full-time domestic helper.

The total number of weekly visits to all types of food outlets was almost 16—very high by Western standards—and included 5.8 trips to a wet market, 3.8 trips to a

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\(^9\) strata are the three main HK areas: Hong Kong and outlying islands, Kowloon and the New Territories.

\(^10\) the average household income of the HK population was estimated at around HK$13,617 in 1989-90; at the annual inflation rate of around 10%, we estimate the average would have risen to HK$22,629 in 1994-5.
supermarket. 2.5 trips to a bakery, 1.2 trips to a fruit store and 1.0 trip to a Chinese grocery store.

Supermarkets and wet markets were located fairly close to the respondent’s home. Travel time to the closest supermarket averaged 5.9 minutes, and to the closest wet market, 7.4 minutes. Thus, interestingly, on average, distance to the closest supermarket is even less than distance to the nearest traditional outlet.

**Hypotheses Tests: Assessing the contribution of the three diffusion processes**

The three diffusion processes suggest three types of variables that affect a shopper's choice of a format for making food purchases. As the three processes could operate independently and simultaneously, we included all three types of variables in a multivariate specification and tested the coefficients of each of the predicted variables for statistical significance. The appropriate analysis for understanding the predictors of aggregate behavior, and drawing managerial implications is estimating the independent contribution of each of the three types of variables to the overall goodness of fit. We specified format choice as a binomial logit model, across all product categories. We treated format choice for each product for each household as an individual observation, \( y_i \), which takes the value 1 if that household purchases that product mainly at a supermarket, and 0 if mainly at a traditional format outlet. Note that the location of purchase is for the specific product, so that each household can contribute up to eight data points, which may be all zeros (if the household purchases all items in traditional outlets), all ones (if the household purchases all items in supermarkets), or any combination of zeros and ones (if the household purchases some items in each of the two different types of outlets). The number of data points contributed by each household depends on the number of different products purchased by the household. Thus,

\[
P(y_i = 1) = \frac{e^{\beta X}}{1 + e^{\beta X}}
\]

\(^{11}\) Estimating the logit model separately by product would not allow us to estimate the contribution of the product-related variable (perishability) relative to the spatial and socio-economic variables.

\(^{12}\) The analysis reported here involves purchases in the two leading supermarket chains. However, we also conducted the analysis using first all of the modern format outlets, and then all modern formats except convenience stores, with little change in the results, and no change in the conclusions.
where $X$ is a vector of factors expected to influence choice, and $\beta$ is the transpose of a vector of parameters to be estimated.

**Measures**

The spatial diffusion hypothesis requires distance to be a critical limitation on format choice. Because the binary dependent variable represents a choice between the formats, we operationalized the distance effect as the difference between the time to the nearest traditional outlet for the product category and the time to the nearest supermarket. The contribution of this distance variable to the overall fit of the model will capture the extent to which spatial diffusion is limiting supermarket share growth.

The socio-economic diffusion hypothesis requires measures indicating opportunity cost of time and the ability to transport and store large quantities of food. Relating specific demographic variables to these economic constructs is difficult. We follow the strategy of Hoch et al (1995) in attempting to identify factors consistent with the household production approach, rather than attempting to find the one true model. From a range of reasonable variables with possible collinearity, we select a subset on the basis of theoretical arguments, and correlation coefficients among them. Candidate variables were collected, including household income, primary shopper's age, car ownership, employment of domestic help, residence size, number of household members, and number of nonworking adults in the household. Car ownership is the obvious major difference across households in ability to transport groceries, and was included in the estimation. While residence size might be a measure of storage space, the fact that Hong Kong living space is usually extremely crowded suggests that the number of household members would also have to be considered. We constructed a new variable, the living area per person in square feet (mean of 141 sq. ft.) which was, indeed, a more significant predictor of format choice than residence area, and therefore used in the final model. While income is an obvious surrogate for opportunity

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11 For most product categories, the relevant traditional alternative outlet to the supermarket was either the wet market or the Chinese grocery store. In these cases, we took the distance to be the shorter of the two distances. For two product categories, bread and tea, distance to the nearest traditional alternative (bakery and tea store respectively) was not available from all shoppers, as the distance question was asked only for the most important shopping outlets across all product categories. In the analysis reported here, we dropped the tea category and dropped those observations for the bread category for which the distance variable was missing.
cost, it was not used. Rather, the number of nonworking adults in the household was used to capture this construct, for three reasons. First, income was significantly correlated with the living density ($r = 0.40$) and car ownership ($r = 0.39$) variables described above, whereas the nonworking adults variable was at most weakly correlated ($r = -0.15$ and $r = -0.003$ respectively). Second, the opportunity cost of shopping time for a household is likely to be very close to that for the individual with the lowest cost, so that the number of nonworking adults should be a strong surrogate for differences in opportunity cost of shopping across households. Finally, the nonworking adult's variable was a more significant predictor in estimation than income. A potential problem arises in that 12.3% of Hong Kong households employ a full time live-in domestic helper, who is unlikely to be considered as a nonworking member of the household, but whose duties typically include shopping. The helper makes it possible for high income households to shop as if they had a low opportunity cost of time, even though they report no nonworking adults in the household. We control for this by including a dummy variable for the employment of a full-time domestic helper, which, like the nonworking adults variable, reflects more time available for household shopping. Thus, the total contribution of this set of variables to the overall fit of the model will measure the extent to which socio-economic diffusion is the limiting factor for supermarket share growth.

Finally, product category was operationalized as a dummy variable, taking value 1 for perishable products (meat, fish, fruit, vegetables, bread) and 0 for the non-perishable products.

We estimated the effects of the three types of variables in a nested fashion, first including only distance, next including distance and the socio-economic variables, and finally including all three types of variables. While the three hypotheses, through the sign and significance of the coefficients, are best evaluated in the grand model with all three types of variables, the differences in goodness of fit, as we incrementally add each set of variables, will indicate the relative contribution of the three diffusion processes to the overall explanatory power of our framework. As mentioned in the theoretical section above, if

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14. For example, suppose one household has 2 people working and each earning $50 a day, and another household has one adult working, earning $100 a day, and one not working. Household income and household income per capita are identical, yet opportunity costs for shopping would be very different, and possibly lead to very different patterns. Hence, "nonworking adults" is a more relevant socio-economic variable for our purposes, as a measure of opportunity cost.
more than one process is operating, the effect size of each process, as measured by the incremental fits, are important for drawing theoretical and managerial implications.

We also included a constant in the specification to capture the residual preference for supermarkets after controlling for these three types of variables.

**Results**

Estimates of these three models (and a base model) are presented in Table 4. We first examine the signs and statistical significance of the variables predicted by the three processes in Model 4, the "grand" model.

<table>
<thead>
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<th>Table 4 about here</th>
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Travel time difference was not significant as significant predictor of format choice at the product level. We also noted earlier that most consumers were about equidistant from both modern and traditional outlets, with both formats not more than a few minutes walking distance for the majority of consumers. We are therefore confident that spatial diffusion is complete (Hypothesis 1 is rejected), and that there is no opportunity to increase supermarkets' 40% market share solely by opening more outlets.

The socio-economic diffusion model predicts a negative sign for number of non-working adults and employment of a domestic helper, both of which indicate a lower opportunity cost of time. It predicts a positive impact of living area per person and car ownership, both of which make it easier to purchase in larger quantities and thus increase benefits from one-stop shopping. Coefficients for all variables were of the predicted signs, but only those for living density and for the number of non-working adults were significant (at the 0.05 level). The coefficient of the number of non-working adults was significant at the 0.10 level. However, contrasting goodness of fit measures for models 2 and 3 indicates that the contribution of the socio-economic variables to the overall goodness of fit is negligible (with $R^2$ barely over zero and a predictive "hit rate" just marginally higher than model 2). Thus, while there is some statistical evidence for Hypotheses 2a and 2b and hence for socio-economic factors influencing format choice, we must conclude that incomplete socio-economic diffusion limits supermarkets, at most, very minimally. There would thus
appear to be little opportunity for supermarkets to increase share by redesigning the format to appeal to unserved socio-economic groups.

The category dependent diffusion model is clearly supported by the evidence of a statistically significant (at the 0.001 level) negative coefficient for perishability. There is clear support for Hypothesis 3, with perishables likely to be purchased at traditional outlets and non-perishables at supermarkets. Moreover, comparing goodness of fit measures for models 1 through 4 (both $\rho^2$ and hit-rates) indicates that almost all of the improvement in fit of model 4 over the base model 1, comes from adding the perishability variable. We conclude that incomplete product category dependent diffusion—in particular, supermarket penetration into the perishables market—is by far the dominant factor limiting supermarket market share in Hong Kong.

The overall $\rho^2$ of the grand model is reasonably high at 0.41, and the predictive "hit rate" is around 85%. Analyzing the hit rate by level of dependent variable indicated that predictive ability was much higher for the modern outlets (94%) than for the traditional outlets (75%).

Finally, the constant is significantly negative, indicating that after controlling for the variables predicted by the three diffusion processes, there is a general underlying preference for the traditional outlets. Given the common assumption in the food retail modernization literature regarding the superiority of, and preference for, the modern supermarket (Goldman 1981), this is a rather interesting and unexpected result. The significant negative constant suggests that, across all products, shoppers generally prefer traditional outlets. We examined the distribution of preferred purchase location of the individual products, and found that two nonperishables (frozen foods and salty foods) were most likely to be purchased in traditional outlets, whereas for all other non-perishable categories, the supermarket was the most preferred location. In the context of the large negative coefficient of the perishability

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15 We caution though that the sign of the constant is influenced by the variables included in the specification. It is a "residual" effect, after controlling for the other variables in the model. Since our model is estimated at the product category level, it is also affected by the product categories included, and whether any product-category related variables are included in the specification. This is why the sign of the constant changes from model to model. It is only when a product-related variable, perishability, is included that the constant becomes statistically significant.
dummy variable, it is likely that the reversal in the dominant pattern for these product categories caused the constant term to be negative.

**Implications for Food retailing in Hong Kong**

Consumer shopping behavior indicates a completed spatial diffusion process, and hence no further opportunities exist for supermarket share growth simply by opening more outlets. In fact, supermarkets are actually located slightly (though not significantly) closer to the average consumer than traditional wet markets, with the average household just around six minutes walking distance from the closest supermarket. This reflects the fact that population is highly concentrated, with the majority residing in clusters of apartment towers in public and private housing estates. The shopping centers in each estate include a supermarket and a wet market\(^6\). The easy accessibility, coupled with very small apartments, also leads to frequent supermarket visits—between three and four times a week on average. Wet markets are visited even more frequently, almost 6 times a week. Supermarket shopping in Hong Kong is not the classic one-stop, once-a-week behavior characteristic of Western countries.

Although spatial supermarket diffusion into existing urban areas is complete, the continuing development of new residential centers, such as the new areas associated with the new airport and new developments, will be accompanied by growth in both supermarkets and traditional outlets.

The only two socio-economic variables that were significant predictors of format choice were living density and number of non-working adults. However, the negligible incremental contribution of these variables to the overall fit and predictive ability of the model suggests that socio-economic diffusion is not the bottleneck for supermarket share growth.\(^7\) The fact that retail format choice is very inelastic with respect to both living density and number of non-working adults (estimated elasticities are 0.14 and 0.07

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\(^6\) Interestingly, the two main supermarket chains are owned by two of the largest property developers in Hong Kong.

\(^7\) This also establishes that, in spite of large variance in wealth and socio-economic standing in Hong Kong, shopping patterns appear remarkably homogenous. More evidence of the homogeneity is the interesting fact that only 2.1% of the entire sample shopped exclusively at supermarkets for all their food needs and 2.6% shopped exclusively in traditional outlets; the remaining 95% exhibited a mixed shopping pattern.
respectively) provides further support for this conclusion. Even if format choice were sensitive to these variables, we see little reason to expect such variables to change much in the future. For example, the proportion of female members of the population in the workforce has remained relatively stable at around 47% in the period 1982-92 (Hong Kong Social and Economic Trends 1982-92, 1993). The lack of sensitivity of choice to these variables coupled with the stability of the variables makes it unlikely that supermarkets’ market share growth in the near future will be driven by socio-economic changes in the population, and unlikely that there exists opportunity for increasing share by redesigning the format to bring in customers from unserved socio-economic groups.

Product perishability had a very significant impact on the tendency to shop for the various product lines in the supermarket, and accounted for almost all of the variance explained by model 4, which included all the variables. While a detailed analysis is beyond the scope of this paper and remains a topic for future research, we will briefly suggest some possible contributing factors to this preference for purchasing fresh food products in traditional outlets some 30 years after the introduction of the supermarket format into Hong Kong. Other survey questions in our study that asked respondents to compare perceptions of fruits and vegetables offered at supermarkets and wet markets revealed that on average, households perceived supermarkets to be around 10% more expensive for these products and to offer less fresh products, as compared to wet markets. There was some variance on the price perceptions, with a little over a third not seeing any price differences, and around 7% feeling that the supermarkets were actually cheaper. Similarly, a fifth of the respondents did not see much difference in the freshness of vegetables between the two formats. Still, the overall lower price perceptions and higher freshness perceptions of the wet markets is consistent with our previous discussion of difficulties that supermarkets have in dealing with these categories.

One reason for supermarket’s weakness in the fresh food lines is found in supply and distribution difficulties. Supermarkets source from the same wholesalers and agents used by wet market retailers and were not able to bypass these and deal directly with suppliers. The large wholesalers supplying China and neighboring countries are the channel leaders in fresh food not supermarkets (Asia Fruit, 1995). They place large orders, get preferred access to products and negotiate better terms. This situation deprives supermarkets of potential economic advantages and causes availability and quality problems. Another reason relates to service effectiveness. Wet market retailers are in direct contact with customers, and respond
fast to their requirements. This contrasts sharply with the limited service in supermarkets. Finally, wet markets enjoy considerable cost advantages because their shrinkage, waste, labor costs, overheads and rents are lower. It will be difficult for supermarkets to compete with wet markets and offer better or even comparable freshness, service and price levels unless they invest heavily in their stores, employees, and in the necessary distribution infrastructures to ensure a regular supply of high quality products. Until major changes in supply and in-store handling of perishables occur, the poor perception of the freshness of perishable items at the supermarket—and the consequent category-dependent limitation on market share—is likely to persist in Hong Kong.

It may also be noted that the average shopper made 5.8 weekly visits to the wet market, a very high frequency of shopping which may be related to the high importance of freshness of ingredients in the local Cantonese cuisine (Anderson, 1988), or to small refrigerators (or both). The in-depth interviews conducted prior to the survey indicated that frozen and chilled meat and fish were not considered fresh; fresh meat was that which was recently slaughtered and fresh fish was live at the time of purchase. These suggest that the almost daily purchase of perishable products is motivated by the importance of freshness rather than the lack of refrigeration.

DISCUSSION

Our objectives in this paper were:

(1) to integrate previous research in food retail modernization into a parsimonious framework, and on this basis,
(2) to develop a relatively easy method to analyze specific limitations to market share gains by modern food retailing formats in any particular setting at a specific point in time, and
(3) to demonstrate an application of the method

Our theoretical framework and method were derived from existing theories of supermarket diffusion, evolution of assortment, and household production. We integrate these theories by developing a tri-parite framework incorporating three phenomena (spatial diffusion, socio-economic diffusion and product category related diffusion), and use the framework to diagnose the state of food retail modernization. Our framework enables us to make some contributions to theory development by highlighting lacunae in these theories. This issue will be discussed later in the future research section.
Our method consists of conducting a survey of consumer shopping behavior for different food categories and then modelling format choice at the household-product level through a series of logit models of format choice. Three sets of independent variables, distance-related, socio-economic related, and product-category related are derived from the theoretical framework. Estimating the relative contribution of each of these three sets of variables to the overall fit of the model allows us to diagnose the current state of the three diffusion processes.

We demonstrate our method in the Hong Kong food retailing environment. We found complete spatial diffusion of supermarkets, nearly complete socio-economic diffusion, and very little diffusion into the perishable category.

We now discuss in greater detail, the application, implications for retail management, applicability of the method to other contexts and future research directions.

The Hong Kong Application

We demonstrate the measurement and statistical procedures by analyzing the state of retail modernization in Hong Kong. The relative simplicity of the food retail system there makes the Hong Kong setting particularly suited to a first and exploratory application of the method. Specifically, the supermarket format homogeneity there greatly simplifies the analysis. In future applications we are likely to face situations where the supermarket sector consists of a number of sub-formats, each characterized by different strategies and, perhaps, by a different profile in the three diffusion processes. In these cases a separate analysis for each of the sub-formats may be needed.

The Hong Kong application also highlights the main features of the method. It is a diagnostic tool able to pinpoint problem areas by identifying the factor(s) constraining further market share growth. It provides a snapshot of the situation at a particular point of time. The method is, therefore, a good starting point for subsequent in-depth analysis of the factors constraining supermarket growth. In the case of Hong Kong, our initial investigations suggest that the existing fresh foods supply infrastructure is difficult for large scale supermarket technology to deal with, leading to higher costs and lower freshness, putting them at some disadvantage (compared to the more fragmented and customized wet market retailers) with freshness-sensitive Hong Kong consumers. To overcome this, supermarkets will either have to invest heavily in supply-chain management, or attempt to incorporate elements of the wet-market system into their stores. A complete assessment of this issue,
involving an evaluation of the supply and distribution systems, infrastructures, government policies, consumers’ preferences and the factors underlying them and the economics of retail operations, is left for future research.

**Contributions to Retail Management**

The main managerial use of our framework and method is as a monitoring device. This is especially useful for supermarket companies operating in countries undergoing a food retail modernization process. In most of these countries market structure and market share statistics are either not available, are unreliable, or are too general to be relevant. Lacking systematic data about market development, these retailers extrapolate from disjoint events and anecdotal observations. Also, they tend to interpret these in light of the Western modernization experiences, which may not always be relevant. Consequently, in these circumstances, both domestic and international retailers risk making major mistakes. This seems to be happening in Hong Kong. Our study clearly shows Hong Kong’s consumers overwhelmingly prefer purchasing perishable lines in wet markets (92 percent purchase their vegetables there, 96 percent their fish, 94 percent their meat, and 70 percent their fruit), and that despite a large variance in wealth and socio-economic standing in Hong Kong the population is remarkably homogeneous in terms of these shopping patterns. Even so, supermarket executives continue to believe in the near demise of the wet market. They stated in interviews with us and in public statements on numerous occasions that growing income, living standards and overall Westernization are driving consumers to abandon traditional outlets and switch to supermarkets (Ling, 1997: Pifer, 1997). A systematic use of our method at, say, yearly, intervals would have provided management with a monitoring device regarding the state of the modernization process and possible changes in the factors underlying share gains. The homogeneity in shopping patterns would have indicated to them that they could not count on these expected consumer-side socio-economic developments to drive market share changes. To accelerate the perishable category diffusion, they need to analyze underlying operational and supply factors which will allow them to meet consumer needs given the current socio-economic structure. Once such an analysis is conducted and strategies devised and implemented, retailers can use our method to monitor progress.

The food retail modernization process in other Asian countries such as China, Indonesia, Malaysia, Taiwan, India, and Thailand is more complex than in Hong Kong. These are much larger countries characterized by a high degree of heterogeneity in
economic, cultural and ethnic conditions in the structure of the supply and retail systems, and in governmental involvement. These conditions vary within each country across regions, cities versus rural areas and across different socioeconomic and ethnic groups. In addition, in the more developed cities, two general supermarket formats—the small neighborhood format and large-scale hypermarkets, super centers or wholesale clubs—are typically involved. Consequently, supermarket companies can be expected to face different diffusion problems in each region. For example, spatial diffusion may limit market share in rural areas, and socioeconomic in some urban centers. However, the many different countries in Asia also share some similarities, such as Asian cuisine with its emphasis on fresh meat and vegetables, a generally high population density in urban areas, a generally low level of ownership of cars, the relatively low cost of labor, enabling the employment of domestic help, etc. Further, the persistence of wet markets throughout Asia suggest that the fresh perishables category limitation observed in Hong Kong will be a factor in most other Asian countries, even as a high level of development is achieved. Taiwan, for example, has a wealthy population and a very even income distribution, and a food retailing sector that includes a well-developed group of foreign and domestic hypermarkets, yet wet markets and street markets remain a major part of the retailing system. Interestingly, Taiwan’s hypermarkets incorporate fresh food departments modeled on the wet market, with a high level of personal service, open bins to allow selection, and live fish tanks. (As we suggested above, this may be a strategy that Hong Kong supermarkets could adopt). In Singapore, grocery chains are experimenting with a new style of outlet: "an upmarket wet market," which combines the wet market atmosphere and wide assortment across stall holders with a "food hall" with shelving, trolleys, refrigerated displays and checkouts. Large food retailers in Japan also retain some elements of the wet market model, using tenants to sell some specialty categories. Urban areas of Thailand have well-developed supermarket and hypermarket food retailing operating alongside wet markets. These observations suggest that, while Hong Kong may be an extreme case, the perishables category limitation is a force to be reckoned with in much of Asia. A recent comment by the merchandising director in the Tops supermarket chain in Malaysia is telling "We focus on providing the best fresh foods (among supermarkets). We want to be the next best thing after a wet market." (New Straits Times, 1998).

More research is needed to actually determine the relative strength of the limitations in each locale, and our method is a flexible tool to do that. We can treat each region as a
separate market and diagnose the state of diffusion of each format (and sub-format where hypermarkets operate) separately. Based on the analysis, retailers may develop and implement competitive strategies, and our method can be used to monitor progress in overcoming the diffusion limitations in each of the regions.

**Applicability of the method to other contexts.**

The framework of three diffusion processes and the analytical method used to diagnose food retail modernization in a given context are easily generalizable not only to other locales but also to other retail situations where new retail formats enter a system, offer assortments overlapping those of existing formats, and thus directly compete with them. Two types of situations are relevant. The first involves the entry into an already developed retail system of a new retail format such as the super center (North America), the hard-discount, limited-assortment supermarket (various European countries), the hypermarket (Latin America, Southern Europe, Germany) and the warehouse club (Europe). The second relates to a general class of retail formats, aiming to replace another class. Examples include modern vs. traditional food retail formats, discount vs. regular formats, “non-store” (catalogues, internet, direct selling, multilevel selling) vs. store formats and specialty vs. general formats. In both types of situations relative market shares have been used to assess the progress of the new entrants. However, market share data suffer from important drawbacks. They do not provide diagnostic information as to the prospects for continued advancement of the new formats and the separate factors limiting their progress. Also, relevant market share data are often not available even in countries where distribution census is highly developed because census classifications do not cover most new retail formats (e.g. super centers, discount and internet retailing).

The behavioral based procedure we use may overcome these drawbacks. Thus, for example, in analyzing competition between super centers and supermarkets in North America, a model that predicts the share of these two formats among frequently purchased product categories (food and non-food) could be based on the same three diffusion processes in our framework. The specific variables in each model could be the same or different as a function of the relevant consumer decision process. A logistic model could then be used to estimate the relative contribution of the three types of variables. As described in Table 1, the three phenomena would lead to differing recommendations for future efforts by both supermarkets and their competitors to protect their shares and for future growth.
Limitations and Future Research

Our theory and method describe a general dynamic process, but our illustrative data are cross sectional and limited to one retail system and to one retail situation. To further validate and refine the theory, longitudinal surveys, studies in additional countries, and studies involving additional retail formats are required.

We emphasize the consumer side and our reliance on consumer data that are relatively easy to collect is a major advantage of our approach. However, an understanding of the dynamics of the diffusion process requires the incorporation into the theory and analysis of management’s considerations and strategies. One important element is the costs associated with each of the three processes. For example, the decision to open new outlets will depend on both the marginal revenues accruing from, and costs of, an additional outlet. In some situations spatial diffusion, as measured by the demand side variable of distance-dependent format choice, may not be complete. An additional outlet will increase share and revenues; however it may not increase profits, and so from the profit-maximizing firm’s point of view, spatial diffusion is complete.18

Another important issue that needs to be addressed is management’s impact on the sequence of the diffusion processes. Since outlets must be available before consumers of any socio-economic group can purchase any product category, spatial diffusion must precede both socio-economic and product category dependent diffusion. Beyond that, it is not clear which of the latter two will come first. Indeed, both can proceed together. Another issue is the factors that impact this process. For example, to accelerate socioeconomic diffusion, management may decide to modify the supermarket format opening small supermarkets in lower income areas and larger ones in higher income ones. Similarly, management’s decisions whether to introduce a product category, its investments and commitment to the project influence the timing and ultimate completion of this process.

Throughout the paper, we have taken the perspective of supermarket management. The framework can also accommodate other perspectives. Of particular importance are public policy issues, such as the impact of subsidies to traditional formats and to the

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18 In Hong Kong, we find no evidence that even revenues could be increased by additional outlets. This is most likely because the very high population density allows supermarket to profitably open new outlets until there are no further demand-side gains. In lower population density settings, limiting factors on opening new supermarkets are more likely to come from the cost side, and these need to be incorporated into the theory.
development of infrastructures on the evolution of retail structure. Understanding the cost-side influences to the modernization processes, as discussed above, will be a necessary part of such research.

A final, more fundamental, issue is the meaning of modernization. Like previous researchers, we have simply taken the supermarket as the prototypical modern format. Limitations to this approach become obvious as the food retailing system develops, and formats proliferate. Measures of modernization, perhaps in terms of consumer welfare, at both the system and outlet level, would be valuable in adding more rigor to the field.

**CONCLUSIONS**

In this paper, we presented a theoretical framework consisting of three independent phenomena, which may drive the adoption of supermarkets in the process of food retail modernization. We described a method based on this framework that enables diagnosing the retail structure into the contributions of these three phenomena. In an application to Hong Kong, we showed that product category dependent diffusion was the primary contributor to the relatively low share of supermarkets. Future research could focus on applying the framework and the methods in other retail contexts — in other countries and in other stages of retail evolution — to refine the theoretical framework and the method of analysis.
**TABLE 1: Presence of International Food Retailers in Asia (selected companies and countries)**

<table>
<thead>
<tr>
<th>Name</th>
<th>China</th>
<th>Indonesia</th>
<th>Korea</th>
<th>Malaysia</th>
<th>Philippines</th>
<th>Singapore</th>
<th>Taiwan</th>
<th>Thailand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrefour</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Wal-Mart</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<td>Ahold</td>
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<td>Price-Costco</td>
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<td>-</td>
<td>+</td>
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<td>Casino</td>
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*Sources: Kuipers (1999)  
AC Nielsen: SRG News (1996)*

*Legend: (1): Withdrew*
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Phenomenon</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A: Spatial Diffusion</strong></td>
<td>Basis of market differentiation of traditional and modern formats</td>
</tr>
<tr>
<td>mainly spatial</td>
<td>mainly household characteristics such as storage space and opportunity costs of time.</td>
</tr>
<tr>
<td><strong>B: Socio-economic Diffusion</strong></td>
<td>product category characteristics such as quality, variety and price.</td>
</tr>
<tr>
<td>demand side: travel cost higher than to</td>
<td>demand side: low opportunity cost of time and limited storage space for some segments</td>
</tr>
<tr>
<td>traditional formats</td>
<td>supply side: cost of meeting needs of these segments (e.g. modifying</td>
</tr>
<tr>
<td>supply side: cost of opening new outlets</td>
<td>supermarket format, small packages, delivery)</td>
</tr>
<tr>
<td><strong>C: Product Category Dependent Diffusion</strong></td>
<td>demand side: consumers perceive traditional outlets to offer better value on quality, variety and price</td>
</tr>
<tr>
<td></td>
<td>supply side: inability to handle these products effectively, high costs.</td>
</tr>
<tr>
<td>Main prerequisite for supermarkets’ eventual domination of food retailing</td>
<td>investment in continued geographical expansion</td>
</tr>
<tr>
<td>large middle class, increased number of women in workforce, larger homes.</td>
<td></td>
</tr>
<tr>
<td>Management’s relative control over main prerequisites</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td>low-medium</td>
</tr>
<tr>
<td></td>
<td>low-medium</td>
</tr>
</tbody>
</table>

35
TABLE 3: EXAMPLES OF IMPLICATIONS TO BE DRAWN FROM HYPOTHESES:

<table>
<thead>
<tr>
<th>Hypothesis 1 (Spatial)</th>
<th>Hypotheses 2a and 2b (Socioeconomic)</th>
<th>Hypothesis 3 (Product Category)</th>
<th>Correlation of Variables</th>
<th>Implication(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepted</td>
<td>accepted</td>
<td>not accepted</td>
<td>spatial correlated with socio-economic</td>
<td>upper and lower class geographic areas exist, and supermarkets have not penetrated the lower class areas; consistent with the &quot;duality&quot; scenario described by early modernization research</td>
</tr>
<tr>
<td>Accepted</td>
<td>accepted</td>
<td>not accepted</td>
<td>none</td>
<td>spatial and socio-economic diffusion limit growth independently; possible early stage of &quot;failure&quot; scenario</td>
</tr>
<tr>
<td>not accepted</td>
<td>accepted</td>
<td>not accepted</td>
<td>N/A</td>
<td>spatial diffusion complete and supermarkets widely available, but some socioeconomic groups not using supermarkets; the &quot;failure&quot; scenario</td>
</tr>
<tr>
<td>not accepted</td>
<td>not accepted</td>
<td>Accepted</td>
<td>N/A</td>
<td>category-dependent diffusion limitations only; the &quot;selective adoption&quot; scenario</td>
</tr>
<tr>
<td>not accepted</td>
<td>accepted</td>
<td>Accepted</td>
<td>none</td>
<td>supermarkets spatially accessible to all; both &quot;failure&quot; and &quot;selective adoption&quot; occur.</td>
</tr>
</tbody>
</table>

\(^a\)When more than one hypothesis is accepted, subsequent investigation must be undertaken to determine the relative contribution of each.
Table 4: Maximum likelihood estimates of logit models of format choice

<table>
<thead>
<tr>
<th></th>
<th>Predicted sign</th>
<th>Model 1: Base</th>
<th>Model 2: Base + Spatial Diffusion</th>
<th>Model 3: Model 2 + Socio-economic Diffusion</th>
<th>Model 4: Model 3 + Category-dependent Diffusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>no prediction</td>
<td>-0.012</td>
<td>0.021 (-0.39)</td>
<td>-0.093 (-0.78)</td>
<td>-2.74&lt;sup&gt;a&lt;/sup&gt; (-12.07)</td>
</tr>
<tr>
<td>Travel time difference (traditional outlet - supermarket)</td>
<td>+</td>
<td>0.007 (0.68)</td>
<td>0.005 (0.55)</td>
<td>-0.001 (-0.04)</td>
<td></td>
</tr>
<tr>
<td>Living area per person</td>
<td>+</td>
<td></td>
<td>0.001&lt;sup&gt;c&lt;/sup&gt; (1.51)</td>
<td>0.002&lt;sup&gt;c&lt;/sup&gt; (1.85)</td>
<td></td>
</tr>
<tr>
<td>Car ownership</td>
<td>+</td>
<td></td>
<td>0.056 (0.40)</td>
<td>0.198 (0.99)</td>
<td></td>
</tr>
<tr>
<td>Employment of helper</td>
<td>+</td>
<td></td>
<td>0.104 (0.54)</td>
<td>0.321 (1.13)</td>
<td></td>
</tr>
<tr>
<td>Number of non-working adults</td>
<td>-</td>
<td></td>
<td>-0.077&lt;sup&gt;a&lt;/sup&gt; (-1.27)</td>
<td>-0.142&lt;sup&gt;a&lt;/sup&gt; (-1.71)</td>
<td></td>
</tr>
<tr>
<td>Perishability</td>
<td>-</td>
<td></td>
<td></td>
<td>-3.914&lt;sup&gt;a&lt;/sup&gt; (-21.64)</td>
<td></td>
</tr>
<tr>
<td>Log-Likelihood</td>
<td></td>
<td>-1026.5</td>
<td>-1026.3</td>
<td>-1023.0</td>
<td>-604.2</td>
</tr>
<tr>
<td>p’ (AIC adjusted)&lt;sup&gt;iv&lt;/sup&gt;</td>
<td></td>
<td>-0.00</td>
<td>-0.00</td>
<td>0.41</td>
<td></td>
</tr>
<tr>
<td>Hit rate (% correct predictions - overall)</td>
<td>0.3</td>
<td>51.0</td>
<td>52.7</td>
<td>84.5</td>
<td></td>
</tr>
<tr>
<td>Hit rate (% correct predictions - traditional outlets)</td>
<td>100.0</td>
<td>74.1</td>
<td>63.2</td>
<td>75.0</td>
<td></td>
</tr>
<tr>
<td>Hit rate (% correct predictions - modern outlets)</td>
<td>0.0</td>
<td>27.7</td>
<td>42.1</td>
<td>94.0</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> (t-statistics in parentheses)
<sup>b</sup> p < 0.01, <sup>c</sup> p < 0.05, <sup>d</sup> p < 0.10; for variables with a priori predicted signs, these are values for one tailed tests of significance

<sup>iv</sup> calculated relative to the base model p<sup>2</sup> = 1 - (LL(model) - number of additional parameters)/LL(base model)
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