

A Planning Template for Nonwork Travel and Transit-Oriented Development

Task I Report: The Growing Importance of Nonwork Travel

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PROJECT OVERVIEW

This project seeks to improve the planning methodology for Transit-Oriented Development (TOD) by bringing into sharp focus the dynamics of the retail marketplace and nonwork travel demand.

Specifically, it will:

- Analyze the current state of understanding of nonwork travel demand in the context of retail market dynamics on a national level.
- Review the state of the art in transportation planning with respect to nonwork travel.
- Create a planning template for transportation and land use planners who are pursuing TOD.

The central Puget Sound region (Seattle-Tacoma-Bellevue-Everett metropolitan area) will be used as a case study for development of the template. The nonwork travel environment of the region will be mapped and analyzed, and the findings generalized to other large metro regions. Of particular interest are “retail” activities that have flexible locations and that together generate more than half of all person trips: shopping for goods and services, eating out, entertainment, recreation, and other leisure pursuits.

The planning template will specify the major nonwork venues that should be mapped and spatially analyzed, the forces shaping urban retail form that need to be monitored, and the factors that will determine TOD regional (not just station-area) success.

EXECUTIVE SUMMARY

Travel for the purpose of engaging in nonwork activities has grown steadily in significance over the last three decades. It now accounts for about three-fourths of all household vehicle trips and 4 of 5 person trips. Nonwork is the major travel purpose even in weekday peak periods, both AM and PM. Increasingly, nonwork trips are linked to work trips as well as to other nonwork trips in tours involving several stops. And nonwork activities may also be indirectly responsible for the increasing volume of commercial vehicle trips.

Yet, in spite of its overwhelming dominance of trip volume, nonwork travel has received little attention in personal travel research and transportation planning compared to the work trip. Nonwork travel is inherently more complicated and therefore more difficult to address analytically -- to measure and to predictively model -- than is work travel. There have been only a few cursory analyses of nonwork travel, and these have neglected the probable impact of the large changes in the consumer marketplace that have occurred in recent years.

A complete picture of personal travel in the United States requires an understanding of nonwork as well as work trips, the specific purposes and spatial locations of nonwork trip generators, and the often complex travel patterns that involve nonwork activities linked in a trip chain or tour. This understanding is of more than academic interest. Nonwork travel, because of its magnitude, has important implications for current transportation and land use policy, particularly transit-oriented development (TOD).

In this report we summarize national trends for nonwork activities and travel patterns. We review the conclusions of previous studies that speculated on the causation of growth of certain categories of nonwork trips, and we offer some additional reasons for nonwork travel growth that seem more explanatory of the observed phenomena. In particular, we relate the growth of nonwork travel to the dynamic changes that have occurred in the retail and consumer services marketplace, particularly to shopping for goods and services, eating out, and other leisure activities. And finally, we assess the state-of-the-art of modeling future nonwork travel behavior in the context of TOD. A simple schematic model for nonwork travel demand is presented that offers a starting point for an improved approach to TOD planning.

CHAPTER ONE

NONWORK TRAVEL DEMAND, PATTERNS, AND TRENDS

INTRODUCTION

Nonwork travel has received relatively little attention in travel research compared to work travel. This may be the result of the presumed regularity and predictability of the work trip, and its association with peak demand and congestion. Nonwork, in contrast, covers a broad variety of purposes, destinations, and starting times. Patterns of nonwork activities for one traveler change from day-to-day, and this has led some analysts to consider it to be discretionary travel.

In real-world applications of transportation data, planners and project engineers often estimate the impact of nonwork trips through standardized trip generation rates for different land uses, covering the spectrum from fast food restaurants to major shopping malls. However, the effect of multiple generators on aggregate travel demand does not appear to have been fully explored.

In this chapter we summarize the current understanding of personal nonwork travel demand, travel patterns, and related trends. We rely on data that has been collected since 1969 by the Nationwide Personal Transportation (NPTS).¹

NONWORK TRAVEL DEMAND

The NPTS provides data on nonwork travel aggregated at the national level (USDOT 1995). Table 1-1 indicates the distribution of the 379 billion person trips by all modes in the United States in 1995, by tour type and specific trip purpose. The totals show that "shopping" generates more individual trips (13.8%) than going "to work" (8.6%), even if "work-related business" (2.8%) is added to commuting. The three next largest purposes are also nonwork categories: "other family and personal business" (9.8%), "other social and recreational" (6.6%), and "eating out" (4.8%). The "other family and personal business" category includes the purchase of services such as dry cleaning, auto repair, personal care, banking, and legal services. "Other social and recreational" includes entertainment, recreation, and cultural events. If we ignore the return trips (to home, work, and other), these four nonwork categories accounted for about 54 percent of all person trips in 1995 (Table 1-2).

Our focus is on these trip purposes because they involve locations that comprise what we define as the "retail" marketplace: namely stores offering consumer goods and services, restaurants and drinking establishments, and venues for a wide range of recreation, social, and cultural activities. These activities tend to have flexible locations, in other words a traveler has more than one possible choice of destination for each activity. The "other" category includes some nonwork

¹ Some of the 1995 NPTS data presented here has been extracted from the survey database and calculated using the online analysis tool provided at the NPTS web site (www.ct.ornl/npts/1995)

Table 1-1 Percentage of All Person Trips by Tour Type and Trip Purpose, 1995

Trip Purpose	Home-to-Home	Home-to-Work	Work-to-Home	Work-to-Work	Other *	Total
All purposes	63.8	10.5	12.1	6.4	8.3	99.8
To work	-	7.5	-	1.0	0.2	8.6
Work-related business	-	0.7	-	2.0	0.1	2.8
Return to work	-	0.3	-	1.4	0.0	1.8
Shopping	10.8	0.4	1.1	0.5	1.2	13.8
School	2.9	0.1	0.1	0.0	0.3	3.2
Religious activity	1.5	0.0	0.0	0.0	0.1	1.6
Medical/dental	0.7	0.0	0.1	0.0	0.0	0.9
Other family/personal business	7.2	0.4	0.8	0.4	1.3	9.8
Take someone somewhere	2.5	0.7	0.2	0.1	0.2	3.6
Pick up someone	2.1	0.1	0.6	0.1	0.2	3.0
Vacation	0.0	0.0	0.0	0.0	0.3	0.2
Visit friends/relatives	4.0	0.1	0.2	0.0	1.1	5.3
Out to eat	3.1	0.1	0.3	0.8	0.7	4.8
Other social/recreational	5.2	0.1	0.2	0.1	1.2	6.6
Other	0.0	0.0	0.0	0.0	0.2	0.2
Return home	23.8	-	8.5	-	1.3	33.6

*Tours that start or end at places other than home or work.

Source: USDOT 1995

Table 1-2 Trip Purposes as Percentage of All Person Trips, 1995

Trip Purpose	Percent	Destination Flexibility
Work and Work Related	18	Not flexible
Shopping	21	Flexible
Other Family and Personal Business	15	Somewhat flexible
Out to Eat	8	Flexible
Other Social/Recreation	10	Flexible
Other	28	Somewhat inflexible

Source: USDOT 1995

activities that are more likely to be constrained to locations that are fixed by circumstances, such as visiting friends, seeing a doctor or dentist, and trips to school and church.

The NPTS may undercount travel for retail purposes. Additional travel to engage in retail activities is probably included in the “take someone somewhere” category. The NPTS records the main purpose of the driver’s trip, but does not query as to the actual purpose for a trip that involves dropping off a rider (6 percent of net trips) who is likely to be a family member. Also, a trip to a downtown or a regional mall may be recorded as one shopping trip if shopping is the main purpose, even though the stop may involve walking to other activities such as eating out or recreation.

MODE CHOICE FOR NONWORK TRAVEL

Table 1-3 indicates the mode used for trips to work and selected nonwork purposes. The private vehicle, in its various forms, dominates as expected. Walking is the second mode of choice compared to transit for a small, but still significant, portion of trips. This is especially true for "eating out" and "other social and recreational" activities, which probably reflects the convenience of walking from home to a nearby neighborhood commercial center that offers these activities.

Table 1-3 Percentage of Daily Person Trips by Mode and Selected Trip Purpose, 1995*

Trip Purpose	Private Vehicle	Public Transit**	Walk	Other***
To work	85.8	3.2	4.3	6.7
Shopping	87.6	1.0	4.9	6.5
Other family or personal business	86.0	1.4	4.6	8.0
Out to eat	86.4	0.5	5.8	7.3
Other social/recreational	79.1	1.8	7.5	11.6
ALL	84.5	2.0	5.3	8.2

*Does not include 3 percent of all trips for which a mode was not ascertained.

**Includes taxicab.

***Includes school bus and bicycle.

Source: USDOT 1995

TIMING AND LINKING OF NONWORK TRIPS

The timing and linkage of nonwork trips is also of interest. Nonwork trips are a major portion of all trips at all times of the day (Figure 1-1). More than 80 percent of trips that start in the 4-7 PM peak period are for nonwork purposes. Many of these trips are individual links in chained trips or tours as indicated in Table 1-4. More than 60 percent of women and 46 percent of men make at least one stop on work-to-home tours. The location of stops in these tours is important because it tends to reflect the spatial distribution of nonwork activities. However, NPTS data is not

geocoded for destination location so it does not give us the spatial pattern of tours.

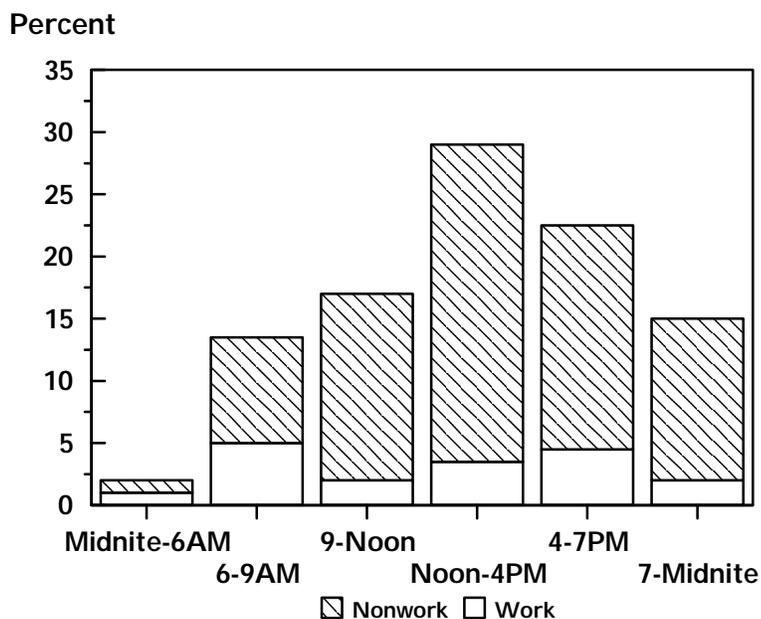


Figure 1-1 Percent of Work and Nonwork Trips by Time of Day
Source: USDOT 1995

Table 1-4 Percent of Men and Women Who Stop on Work-to-Home Tour

Number of Stops	Men	Women
One or more	46.4	61.2
Two or more	17.7	28.3

Source: McGuckin & Murakami 1998

As chaining of nonwork with work trips has become more prevalent, the distribution of nonwork trips across the seven days of a week has changed. For example in 1995, 77 percent of all shopping trips occurred on weekdays. On average, shopping trips had a higher frequency on weekdays than on weekend days (USDOT 1995).

VEHICLE OCCUPANCY

As Table 1-5 shows, vehicle occupancy has decreased for all major trip purposes since it was first recorded in 1977. Yet occupancy for nonwork trips remains considerably greater than for work trips, reflecting the social nature of shopping, family business, and leisure activities.

Table 1-5 Trends in Average Vehicle Occupancy for Selected Trip Purposes

Trip Purpose	1977	1983	1990	1995	Change (1977-95)
To or from work	1.30	1.29	1.14	1.14	-15.4%
Shopping	2.10	1.79	1.71	1.74	-19.1%
Other family or personal business	2.00	1.81	1.84	1.78	-10.0%
Social and recreational	2.40	2.12	2.08	2.04	-16.7%
All purposes	1.90	1.75	1.64	1.59	-15.8%

Source: USDOT 1995

NONWORK TRAVEL DEMAND GROWTH

Nonwork travel can now be tracked across five applications of the NPTS as shown in Tables 1-6 and 1-7.² Although nonwork person trips have remained essentially constant as a share of all trips (Table 1-6), nonwork vehicle trips have increased in relative significance (Table 1-7). The largest vehicle trip frequency growth over the 26 year period has been for purposes of shopping and other family and personal business. VMT and vehicle trip length also increased until 1995, when some decreases were noted. Work trips grew between 1990 and 1995 as employment expanded in a strong economy.

The average length of trips show interesting differences. Work, shopping, and other family and personal business trips all increased in length to about the same degree in the 1969-90 period. In contrast, social and recreational trip lengths decreased.

Table 1-6 Distribution of Person Trips and Vehicle Trips By Purpose, 1969-1995

Trip Purpose*	Person Trips					Vehicle Trips					
	1977	1983	1990	1990 Adj.	1995	1969	1977	1983	1990	1990 Adj.	1995
Shopping	17.1	18.0	18.9	19.3	20.2	15.2	17.0	20.0	20.3	20.8	21.6
Other family & personal business	14.0	17.4	22.7	26.2	25.6	14.0	14.0	18.3	24.1	27.9	27.0
Social and recreational	24.4	27.7	24.8	26.8	24.9	22.4	19.3	22.6	20.5	22.0	18.4
Other*	21.4	14.1	12.1	10.0	9.0	12.2	16.8	8.4	7.0	5.0	5.8
All nonwork	76.9	77.2	78.4	82.4	79.7	63.8	67.1	69.3	71.9	75.7	72.8
Work & related	23.1	22.8	21.6	17.6	20.3	36.2	32.9	30.7	28.1	24.3	27.2

*Purpose definitions are as used for surveys prior to 1995.

**Includes trips to school, church, doctor/dentist, and to dropoff/pickup.

Source: USDOT 1995.

² Per capita figures, rather than per household, have been used to weight declining household size. The data is divided into two periods to reflect changes in the survey methodology that were made in the 1995 NPTS.

Table 1-7 Percentage Change in Vehicle Travel and Trip Length by Trip Purpose, Per Person, 1969-90 and (1990-95)

Trip Purpose	Average Annual Vehicle Trips	Average Annual VMT	Average Vehicle Trip Length
All purposes	27(12)	27(15)	1(2)
To or from work	1(22)	20(33)	17(8)
Shopping	76(16)	108(28)	16(16)
Other family & personal business	137(8)	169(1)	14(-5)
Social and recreational	15(7)	-1(11)	-10(-5)
Other*	27(36)	-32(68)	1(23)

* Includes trips to school, church, doctor/dentist, and to dropoff/pickup.

Source: USDOT 1995

COMMERCIAL VEHICLE GROWTH

The increases in nonwork activities may have spawned increased commercial vehicle travel indicated in Table 1-8. As activities increase in number and variety, more truck traffic supplying goods and services can be expected. The number of trucks in commercial service has grown at a pace that far exceeds the growth in population.

Table 1-8 Growth of Commercial Trucks in Service, 1987-97

Major Use	1987 Trucks (1000s)	1992 Trucks (1000s)	1997 Trucks (1000s)	Percent Change 1987-97
Wholesale trade	969.5	1,136.1	1,264.6	30.4
Retail trade	1,537.1	1,950.9	2,243.8	44.9
Services	1,980.8	3,123.3	4,233.5	113.7
Daily rental	147.6	307.6	508.0	244.2
<i>US Population</i>	<i>242,231</i>	<i>255,039</i>	<i>267,636</i>	<i>10.5</i>

Source: US Bureau of the Census

CONCLUSIONS

The large growth in personal travel in the last three decades has in large part resulted from increased frequencies of nonwork trips, especially trips for shopping and other family and personal business activities. Retail activities account for more than half of all person trips, and most are made to locations that are flexible in that the traveler has more than one choice of

destination for a given activity. Many retail trips are linked in complex tours that may involve multiple stops for a variety of purposes and several family members traveling together. These tours require the flexibility that the private vehicle provides, and consequently transit and pedestrian modes are chosen for a small proportion of all person trips. The growth of nonwork personal travel may be correlated with a large observed increase in commercial vehicles that provide goods and services in support of both in-home and out-of-home needs and activities.

CHAPTER TWO

RETAIL STRUCTURE AND NONWORK ACTIVITY TRENDS

INTRODUCTION

We next summarize the transformation that has occurred in the national retail environment in the new postindustrial, information-based economy. Societal, behavioral, and market forces have combined to create new patterns of retail structure and nonwork activities. Our focus, illustrated by available national data, is on the major changes that have transpired in the last three decades in the consumer goods and services marketplace. These changes are ongoing and have important transportation policy implications which can be better understood in the context of the factors that determine retail location and consumer behavior (see Chapter 3).

NEW STORE FORMATS

The retail landscape has been reshaped by the introduction of numerous new “discount” formats, some at the expense of traditional formats such as department stores and smaller, often neighborhood, stores. The new formats range from mass merchandisers like Wal-Mart to a wide variety of specialty retailers, the so-called superstores, to convenience stores (Table 2-1). The pace of their introduction has been extraordinary (Table 2-2), typically yielding a tenfold or more growth in the number of stores over two decades. Because of the many variations and the constantly changing environment, it is difficult to classify all of the store concepts and formats. But nine distinct categories stand out, each increasingly dominated by a small number of national chains.

Table 2-1 The New “Discount” Mass Retail Formats

Format	Approx. Units Nationwide - 1998	Size Range or Average (sq. ft.)
Mass merchandiser (discount department store)	9,000	10,000-100,000
Supercenter	1,000	120,000-200,000
Club warehouse	800	100,000
Specialty or “super”store	91,500	20,000-100,000
Home center	1,000	150,000
Outlet store	10,000	10,000
Combination supermarket	3,900	59,000
Combination drugstore	3,600	13,500
Convenience store	93,200	800-5,000

Source: Discount Merchandiser 1999; National Association of Convenience Stores 1998; American Express, 1999.

Table 2-2 Selected Examples Indicating the Rapid Growth of Mass Retailers

Chain	Category	Units		
		1979	1989	1999
Wal-Mart	Discount Department Store	229	1,378	2,433
Home Depot	Home Center	3	118	761
Toys "R" US	Toy Superstore	84	522	700
Costco	Wholesale Club	--	43	217
Circuit City	Home Electronics Superstore	--	125	585
Staples	Office Supplies Superstore	--	50	745
Walgreen's	Combination Drugstore	926	1,416	2,800

Source: Discount Merchandiser; Chain Store Age

Mass Merchandisers

Mass merchandise stores, sometimes called "hypermarkets", are departmentalized retailers that sell hard goods, apparel and other soft goods, health and beauty products, and other general merchandise. The best know examples are Wal-Mart, Kmart, and Target. These three dominant national chains have stores in almost all states. Other smaller chains operate in multi-state regions. Together, mass merchandisers account for over half of the total sales of the mass retailing industry.

Supercenters

Mass merchandisers are increasingly moving to the supercenter format, which combines a full-line mass merchandise store with a grocery supermarket. The number of supercenters doubled between 1994 and 1998, to almost 1000 units in 42 states (Discount Merchandiser 1999). Supercenters have an average sales mix of 40 percent food and 60 percent nonfood.

Wholesale Clubs

Wholesale club stores combine a more limited selection of hard goods, soft goods, and food than mass merchandisers, generally in a self-service, warehouse environment. Customers become members by paying an annual fee. Three national chains control the market. Their warehouse stores are now operating in all 50 states, and their proportions of food and nonfood sales is similar to that of supercenters.

Superstores

Superstores, also known as “category killers”, are chain stores that control a particular specialty market (Table 2-3). These stores attract customers by offering a large variety of goods within their niche. Superstores typically have a large trade area equivalent to that of a regional mall. In fact, many tend to cluster near malls creating major retail concentrations. However, they are not just a suburban phenomenon; superstores are distributed widely across the urban landscape, both inside and outside central cities. Because of its recent and rapid growth, the superstore phenomenon has not been well-documented.

Table 2-3 Kinds of Superstores

Category
Arts and crafts
Books
Car electronics
Computers
Drugs & misc. goods
Electronic games
Fabrics
Food specialities
Garden supplies
Home electronics
Home furnishings
Music recordings
Office supplies
Pets & supplies
Sporting goods
Thrift (second hand)
Video tapes

Home Centers

Home improvement centers are distinguished from other specialty retailers by the size of store and the scope of goods offered, which covers a great variety of items for home repair and remodeling, and often garden supplies as well. These stores, which cater to the do-it-your selfer and small remodeling contractor markets had combined sales of about \$50 billion in 1998.

Outlet Stores

Factory outlet stores are operated by manufacturers who need a place to sell discontinued lines of merchandise and residuals. They tend to cluster in outlying malls. When counted in in 1992, there were approximately 10,000 stores in 300 malls or centers (Packaged Facts 1995).

Super or Combination Grocery Stores

Grocery stores are growing in size and decreasing in number, even as population grows. The number of stores peaked in about 1978 and over the last two decades has been steadily decreasing (Figure 2-1). Between 1990 and 1995, all types of grocery stores decreased 7 percent. Conventional supermarkets decreased 20 percent while the number of grocery “superstores”, which typically have a delicatessen, bakery, and nonfood goods and services, increased 17 percent. Some grocery stores have added gasoline pumps. As a result, trips to the supermarket are growing in distance and probably in time expended.

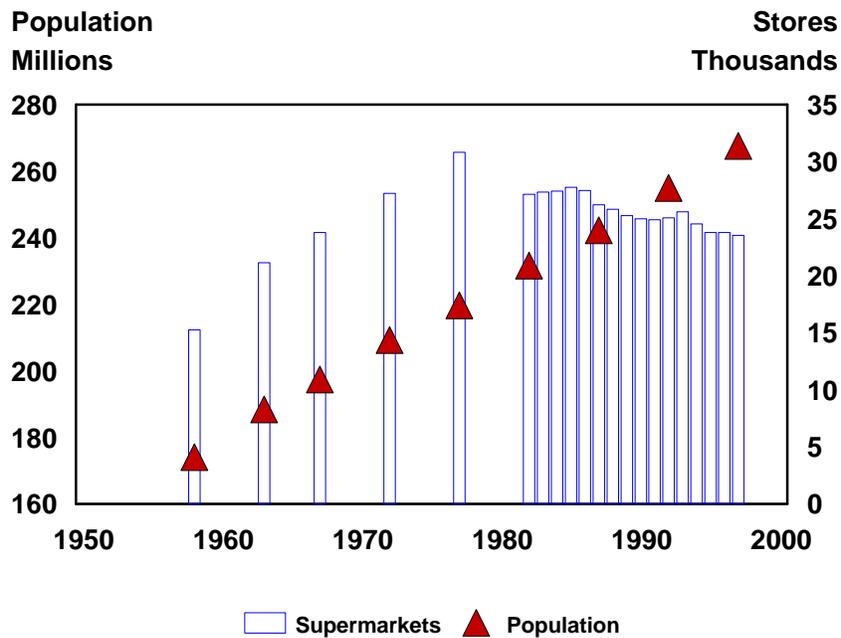


Figure 2-1 Relative Growth of Grocery "Supermarkets" and Population, 1958-1997
 Source: U.S. Department of Agriculture, Economic Research Service 1998

Combination Drug Stores

New drug stores typically offer a range of other products from food to household items. These combination stores have joined a drug store with the modern version of the variety store that one might have found in a neighborhood shopping centers a generation ago. Their market is the customer in a hurry who appreciates a drive-through pharmacy and a range of other products.

Convenience Stores

Three decades ago many neighborhoods were still served by small neighborhood “mom and pop” convenience stores. Many of these have disappeared and have been replaced by stores operated by national chains, including petroleum companies. Convenience stores are increasingly oriented to the drive-to customer. Arterial locations are thus a prerequisite. In the past 30 years the convenience store market has grown to the point of saturation and beyond, and after a period of shakeout, appears to be growing again in sync with population (Figure 2-2).

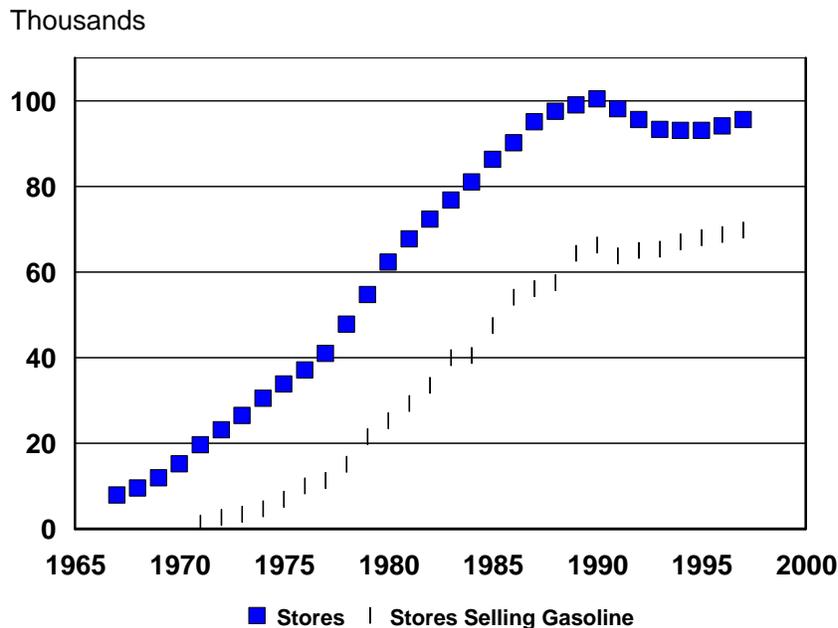


Figure 2-2 Convenience Store Trends
Source: National Association of Convenience Stores 1998

Most convenience stores combine gasoline sales with in-store convenience goods, primarily tobacco, alcohol, and snack foods. Recently, several of the major mass retailers, wholesale club, and grocery store have moved into the retail gasoline market, with some observers predicting that they will carve out 20 percent of the gasoline market in 10 years.

NEW CONSUMER SERVICES

The importance of the service industry in the new economy is often measured by its increasing share of the job market. But another measure is the growing diversity of commercial services. Many specialty businesses have been created just for the maintenance and repair of houses, cars, and other personal equipment, and to serve other household and small business needs. Several services in these categories are listed in Table 2-4. A number of these reflect the society's

growing wealth and decreasing available time. More people place a higher value on their time and will pay for services, even for routine home maintenance tasks that may have been previously performed by a household member. Time freed up can then be used for higher-valued purposes, whether work or leisure.

Table 2-4 New Consumer Services

Services that We Go To
ATMs
Specialized auto servicing and repair
Copy centers
Day care
Health clinics
Personal beauty care
Services that Come To Us
Package delivery
Home systems repair
Landscaping
Housecleaning
Use goods charity pickup
Municipal recycling pickup
Home security

Fewer Full Service Gasoline Stations, More Specialty Auto Services

Some services we access by traveling; others come to us. One source of increased personal travel has been the major changes in the auto service industry. Routine auto maintenance and repair, once available mainly at neighborhood service stations, independent repair centers, and auto dealerships, is now provided by numerous national chains each offering a narrow selection of services. Figure 2-3 shows approximate numbers and trends for several of these categories.

These specialized auto centers have largely replaced traditional service stations, which continue to decline in number. The shares are based on stations counts in US metropolitan areas, where most gasoline is marketed. In 1972, when the U.S. Census Bureau did a count, few outlets other than traditional service stations sold gasoline. Currently, about 70 percent of all gasoline by volume is sold at “pumpers”, stations with multiple self-service pumps, and convenience stores. Gasoline outlets of all types continue to decrease in number and the rate of decrease seems to be accelerating (Table 2-5).

As full service gas stations have declined in number, numerous niche auto services have entered the scene. National and regional chains provide essential repair and maintenance services in a number of categories: mufflers, brakes, lubrication, and cleaning. Full auto service now may involve separate trips to several different shops.

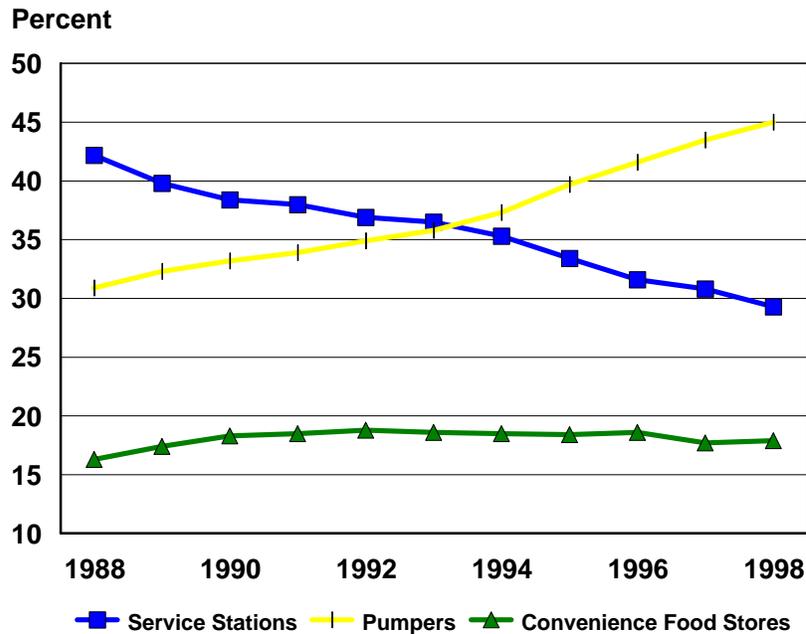


Figure 2-3 Gas Station Trends by Key Categories
Source: National Petroleum News 1999

Table 2-5 Count of US Gasoline Stations

Year	Total Outlets	% Change from 1972
1972	226,459	--
1993	207,416	8
1994	202,878	10
1995	195,455	14
1996	190,246	16
1997	187,892	17
1998	182,596	19
1999	180,567	20

Source: National Petroleum News 1999

GROWTH OF OUT-OF-HOME DINING

Dining out continues to be a strong feature of American leisure habits. Although people are not eating and drinking more, they appear to be enjoying their food and drink in many different places. While per capita food expenditures remained essentially constant, food consumed away from home grew from 34 percent of food expenditures in 1970 to 45 percent in 1997 (U.S. Department of Agriculture 1998). The number and variety of eating and drinking establishments

grew even faster. In the period 1963 to 1992, the total of these venues rose 66 percent, compared to a 35 percent increase in population.

As viewed from the consumers perspective, several reasons have been suggested for the increase in spending on food away from home: 1) the increase in two-earner households that leaves less time for food preparation, and which also increases household income and makes more discretionary income available; 2) the rise in single person households; and 3) the greater variety of restaurant options available (Robicheaux & Harmon 1997).

Fast Food Dominance

Table 2-6 indicates the current major restaurant industry segments and market shares of the leading 100 companies in 1998. These companies accounted for about \$125 billion in sales and 164,000 units (Nation's Restaurant News 1999). This was about half of all away from home food expenditures and two-thirds of all units. Fast food -- sandwiches, chicken, pizza, snacks -- is the predominant choice over sit down eating, and it represents more than half of all units.

Table 2-6 Restaurant Market Share by Major Market Segments for Top 100 Chains

Concept	Market Share - Percent
Sandwich	42
Dinner House	10
Pizza	9
Family	7
Chicken	6
Snack	2
Grill-Buffer	2
Fish	1
Other (Contract/sports concessions, Hotel, Buffet, Coffee, Convenience Store, In-Store, and Theme Park)	21

Source: Nation's Restaurant News 1999

Popularity of Cuisines

Although national counts that would reveal the restaurant industry's fine structure are lacking, the changes in the restaurant industry involve much more than the growth of fast-food establishments. For example, foreign and specialty cuisines have shown astonishing popularity, and consequently the food dollar is being spent at many more locations than previously. An industry survey of leading chefs strongly pointed to ethnic cuisines and foreign flavors as the dominant trend (National Restaurant Association 1999). The impetus, in part, may be due to the large immigrant stream from many nations in the last decade. Another factor may be the growing

number of Americans who travel abroad and are exposed to foods of different regions and cultures.

The Coffee Phenomenon

One change more than any other that perhaps marks the shift to a new economy, with its high level of disposal income, is the rapid emergence of establishments offering coffee by the drink. Located where there is traffic, whether auto or pedestrian, coffee dispensaries of all kinds have virtually exploded onto the retail landscape in the last decade. These cafes, kiosks, bars, and movable carts have become important stops in the daily travel routines of many Americans. Although the industry is dominated by national and international chains, many individual entrepreneurs also have gained a piece of the action. The largest chain, Starbucks, grew from 55 units in 1989 to 1,555 units in 1998.

The Take-Home Phenomenon

Even though long-term retail trends are most revealing of changing travel patterns, short-term changes also can shed some light on the systemic changes that have occurred in nonwork travel. The recession of the early 1990's reduced discretionary spending, and changed, at least temporarily, the spatial pattern of food expenditures. Spending on food away from home fell 13 percent between 1987 and 1997. Yet the shift was to take-out food for home consumption rather than to home prepared food. According to an industry publication, consumers now opt for a take-out dinner 61 percent more often than they did 10 years ago (Russell 1999). Another indicator of the trend toward home meal replacements is the growth of grocery store delis, which are now found in 81% of stores (Progressive Grocer 1999). More ready-to-eat or ready-to-heat meals obviously involve more trips to the supermarket as well as fast food stores.

GROWTH OF LEISURE/RECREATION/ENTERTAINMENT SERVICES

Recreation is still another example of the major transformation that has occurred in nonwork activities (Table 2-7). The share of household expenditures on entertainment and recreation, increased forty percent between 1950 and 1995, from 4.0 percent to 5.6 percent (U.S. Department of Labor). Real dollars spent by all households on entertainment jumped 8 percent between 1987 and 1997. Most of this growth was for householders over age 45. Since a large portion of recreation is consumed outside the home, the travel effects have been equally large. About half of entertainment expenditures are for services (club memberships, fees for participation sports, lessons, and admissions to various events) and for equipment (sporting goods, boats). Public investments in recreational goods such as parks and sports facilities also increased in this period.

More revealing are economic studies that show consumer expenditure elasticities nationally for recreation have fallen dramatically as incomes and leisure time have increased, and as invention and technology have stimulated a rich diversity in the types of recreational opportunities, whether for participants or spectators (Costa 1997). In other words, people are able to buy much more

recreation value for every dollar they spend, and they are able to select the form of recreation that best serves their interests, age and lifestyle. Thus per capita participation rates have increased. These changes have had a significant effect on travel for recreational purposes.

Table 2-7 Leisure Activities and Venues Showing High Rates of Growth

Leisure - Major Trip Generators
Cabarets and clubs
Casual outdoor recreation
Eating and drinking establishments
Health clubs
Live performances
Participant sports
Spectator sports
Video arcades

Leisure involves a broad range of out-of-home activities: spectator and participatory sports, attendance at cultural events, and casual recreation, such as hiking or bicycle riding. In recent years a number of new opportunities in all of these categories have been created. At the same time, sports participation has become far more equal with the advent of new women's organized college and professional leagues, and women's and co-ed local games. Technology has given more people the opportunity to find a sport or exercise regime that fits their interests and abilities.

The trends in leisure time and entertainment expenditures can be attributed to demographic patterns, the movement toward healthier lifestyles, and new technology (Schwenk 1992). In 1989, baby boomers between age 35 and 44 spent more than those in other age groups on recreation and entertainment. As these people age, they can be expected to have more discretionary income to spend on leisure activities compared to previous generations.

Measuring Participation in Recreational Activity

The great diversity of leisure opportunities makes analysis of participation rates and the spatial patterns of venues very difficult. Given the ever-changing nature of leisure, trends are even more difficult to follow. Most activity surveys are either lacking in scope or accuracy of measurement technique to allow much more than the identification of broad trends. One national survey has tracked attendance at live artistic performances and participation in other leisure activities since 1982 (National Endowment for the Arts 1998). Growth in participation rates is evident in most major categories (Table 2-8).

Table 2-8 Estimates of Attendance Rates at Arts Events and Participation Rates in Other Leisure Activities

Activity	Percent Attending or Participating Once in Last 12 Months			
	1982	1985	1992	1997
Classical music	13	13	13	16
Musical play	18	17	17	25
Non-musical play	12	12	14	16
Active Sports	39	41	39	45
Exercise	51	57	60	76
Amusement Park	49	45	50	57

Source: National Endowment for the Arts 1998

ORGANIZATION OF RETAIL USES IN METROPOLITAN SPACE

In addition to the growing variety of retail activities and trip generators, the spatial structure of retail activity has undergone major reorganization in the past few decades. We can only review here the highlights of these changes that, on either a national or regional level, have not been carefully inventoried or analyzed.

Growth in Numbers and Types of Shopping Centers

The planned shopping center is largely a post WW II invention. Figure 2-4 shows the growth in number of shopping centers of all categories and sizes since 1986, when reasonably accurate national data was first collected. For shopping centers of all sizes, the 1980's was a period of rapid growth that mirrored the increasing numbers of baby boomers who have high levels of personal expenditures.

Over half of all shopping center area is in centers that are less than 200,000 square feet (Figure 2-5). On a per capita basis, the amount of shopping center area has continued to increase. If auto sales are ignored, planned shopping centers now account for more than half of all retail sales (ICSC 1998). Over the years, new types of centers have emerged, comprising a wide variety of spatial configurations and sizes (Table 2-9).

Superregional Centers

Superregional centers, anchored by traditional and discount department stores and specialty clothing stores, offer a wide variety of merchandise and services. An enclosed pedestrian mall connects stores that may have a multilevel configuration. In spite of much retail specialization and new spatial configurations, superregional centers continue to be built, with five completed in 1996. New centers, and upgraded older centers, increasingly combine shopping with food and services, and with entertainment for all ages.

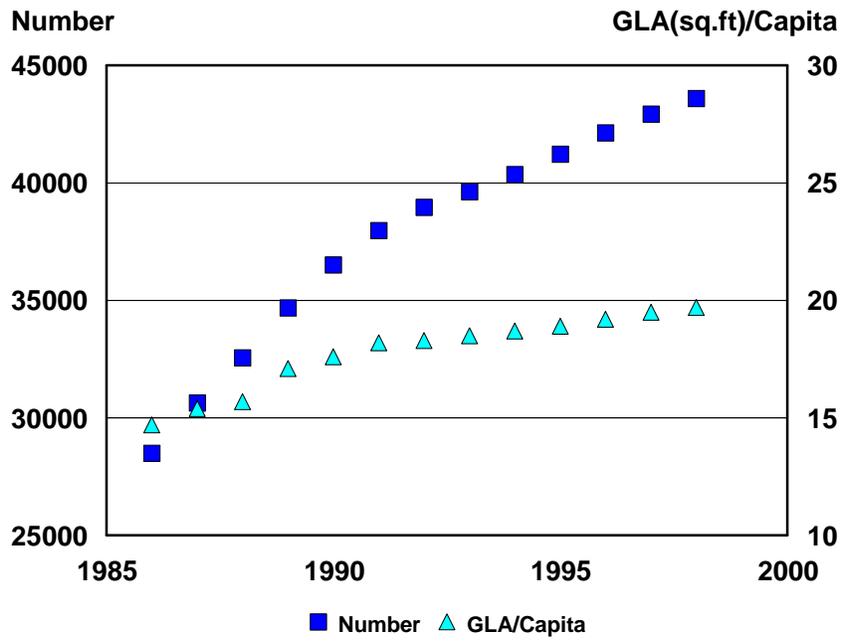


Figure 2-4 Shopping Center Trends
 Source: National Research Bureau 1999

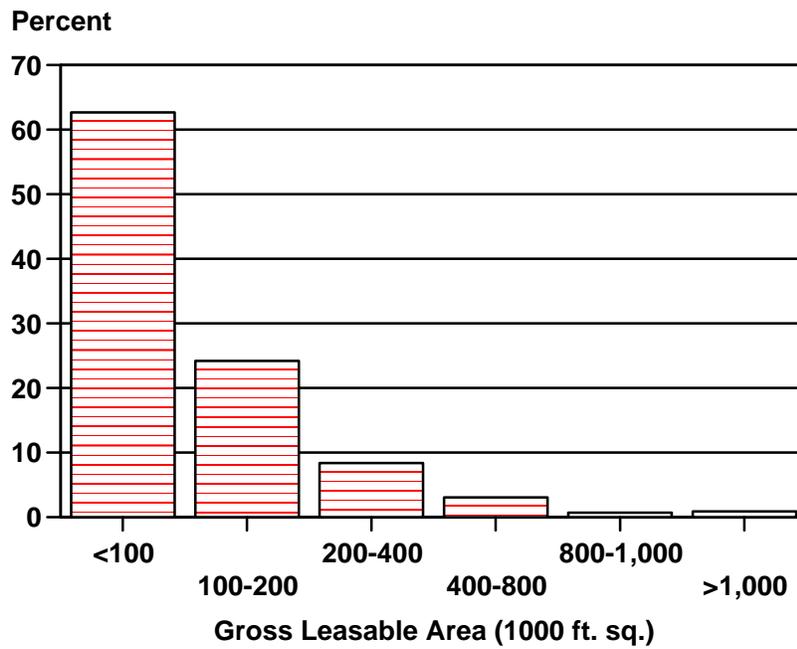


Figure 2-5 Distribution of Shopping Centers by Size, 1998
 Source: National Research Bureau 1999

Table 2-9 Types and Spatial Characteristics of Shopping Centers

Shopping Center Type	Typical Configuration	Area -Sq. Ft.	Primary Trade Area - Miles
Super regional	Mall, usually enclosed	>800,000	5-25
Regional	Mall	400,000-800,000	5-15
Community	Strip	100,000-350,000	3-6
Neighborhood	Strip	30,000-150,000	3
Power	Freestanding cluster	250,000-600,000	5-10
Specialty	Mall	80,000-250,000	5-15
Theme	Mall, sometimes in historic building	80,000-250,000	N/A
Outlet	Mall, strip, "village" cluster	50,000-400,000	25-75

Source: International Council of Shopping Centers 1998

Regional Centers

Similar to but smaller than superregional centers, these malls also provide a variety of general merchandise that is dominated by apparel and other soft goods.

Power Centers

Power centers typically are dominated by several large freestanding anchors, that may be discount department stores, warehouse clubs, home centers, or superstores. They rarely have more than a few specialty stores. Power centers, nonexistent a decade ago, have proliferated rapidly. By one count there were 329 in 1994 and 504 a year later (ULI 1996).

Outlet Centers

Outlet centers contain mostly manufacturer's outlet stores that sell their own brands at a discount. They are seldom anchored. Usually located in rural areas, where lower rents allow lower costs, they attract both tourists and residents of nearby urban areas.

Theme Centers

Occasionally a center is built around a single architectural design theme, that in some cases is also carried over to merchandise. Theme centers are often located in older buildings that have been adapted to the new use while maintaining their historic character.

Specialty Centers

Some centers specialize in one type of product or cater to a specific clientele. Fashion centers typically have upscale apparel shops, boutiques, and personal accessory stores. Other centers are organized to appeal to certain ethnic and social groups, and the stores offer products and services

familiar to the particular group. These centers, rather than relying on an anchor, may increase their attractiveness by including restaurants or entertainment.

Neighborhood Centers

Neighborhood centers provide convenient access to some essential household goods and services. Commonly anchored by a supermarket or drugstore, these centers also are supported by stores that offer sundries, prepared food, and consumer services.

Community Centers

Larger than neighborhood centers, community centers offer a wider variety of soft goods and household items, as well as food and drugs. Common anchors include supermarkets, super drugstores, discount department stores, and off-price specialty retailers. But community centers exhibit the widest range of store formats of all types of shopping centers.

Other Spatial Pattern Changes

Retail Activity Increasingly Polycentric and Dispersed

That metropolitan America is rapidly developing a polycentric structure is a fact that has been widely documented. Perhaps an extreme example is the Atlanta region, which has more than 70 retail cores, including downtowns and regional malls, with over 1000 retail employees each (Fujii & Hartshorn 1995).

Clustering at Regional Centers - Major Retail Perturbations

Both regional and superregional centers are often surrounded by other smaller centers that together comprise very large retail concentrations. National and regional data on the number and size of these commercial clusters is lacking. Toronto's large regional malls are each surrounded by about a dozen smaller malls (Simmons, et al 1996).

Freestanding is Still a Major Choice

Many national chains prefer freestanding sites for enhanced visibility and customer access. In 1997, more than half of retail construction starts in US were freestanding (Levine 1998).

Decay, Renewal and Adaptation of Older Neighborhood Centers and Arterial Strips

The major changes in store format and size, and the increasing number and variety of shopping centers has obviously had an impact on older community and neighborhood centers and strips, as well as the downtowns of older cities in a metropolitan region. Although the activity in some of these commercial areas has declined, they remain the loci for a large amount of a region's goods and services activity.

The disappearance of the neighborhood grocery has been documented (Yim 1993). However, other than a few studies of individual inner city strips and centers and some anecdotal information about the condition of strips elsewhere (Loukaitou-Sideris 1997; Jacobs 1997), there appears not to have been a systematic study of the change that these centers have experienced either nationally or across a particular metro area. Studies indicate that some older neighborhood and community centers have adapted and prospered by becoming specialty centers. Their new trade area can be regionwide. Others have declined and languished.

Markets Differentiated by Age and Lifestyle

Many stores, especially those selling apparel and other soft goods, target markets having narrow age and lifestyle ranges. Thus household shopping excursions can be expected to involve stops at several different locations, or in the extreme, several separate trips.

Maldistribution of Essential Services

In some instances the market does not provide convenient access to necessary goods and services for those with low levels of mobility (USHUD 1999). One example that has been studied is the lack of inner-city supermarkets, and as a consequence, higher food prices and/or transportation costs for residents of these areas. A study of twenty-one metro areas found significantly fewer grocery stores per capita in the lowest-income areas compared to region wide averages. These same areas also had the lowest rates of vehicle ownership (Cotterill & Franklin 1995).

STUDIES OF US METROPOLITAN RETAIL STRUCTURE

There appear to have been only a few recent studies of the retail structure of US metropolitan regions. An examination of metropolitan Atlanta found that retail activity in existing neo-traditional communities tended to be limited in scope -- coffee bars, restaurants, and dry cleaners -- and that general household shopping requires numerous auto trips outside the neighborhood (Fujii & Hartshorn 1995).

E-COMMERCE

The Internet is providing a new way for people to go shopping. People can dial into the World Wide Web to learn about products they can buy, and increasingly, place orders to be delivered by a parcel delivery service. Business response to the advent of consumer use of the World Wide Web in the mid 1990s has led to exponential growth in retail shopping via personal computers, and seemingly long-term acceptance of on-line buying as an alternative to in-store shopping.

Internet Use and Shopping Trends

Table 2-10 shows one estimate of the growth in Internet users, with about 30 percent of US households online in late 1999. Table 2-11 is a 1998 estimate of consumer online purchases for

each year 1995-2000, projecting an exponential growth curve. In fact, following Christmas 1998, the private research estimates for consumer on-line spending for that whole year were revised upward to range from \$7.1 to \$12.4 Billion (Thompson 1999). The volume of Internet shopping is still very small in comparison to \$2 trillion dollars of annual retail spending, but is approaching 10 percent of retail catalog shopping volume. One research firm (Forrester Research 1998) estimates that online shopping will total \$108 billion and account for 6% of all US retail sales by 2003.

Table 2-10 US Internet Household Users

Year	Households (millions)	% of Total Households
1996	6.5	6.6
1997	14.5	14.5
1998	24.4	24.2
1999	28.0	27.6
2000	32.0	31.4
2001	35.3	34.4
2002	44.0	42.7

Source: www.emarketer.com/estats/nmsg_hhg.html

Table 2-11 Consumer Goods Purchases

Year	Purchase (\$ millions)
1995	450
1996	750
1997	1,500
1998	3,700
1999	6,100
2000	10,000

Source: www.emarketer.com/estats/ec_proj.html

The leading items purchased via electronic shopping as of 1999 are computer hardware and software, books, recorded music, home electronics, videos, travel services, event tickets, gifts and flowers, and (mostly casual) clothing. Groceries, furniture, and automobiles sales are just beginning. Of the top ten Internet retailers, the vast majority do not have stores, for example, Amazon, Dell Computer, Egghead Software, and CD-Now. Bookseller Barnes & Noble is a major exception, although they are running their stores and their web site as separate operations. Major catalog retailers like L.L.Bean have launched web sites, and so have many store retailers like Walmart and Nordstrom, although their efforts are as of late 1999 still preliminary.

Internet Shopping's Future

The Internet brings impressive new capabilities to the shopper: rapid market wide searches for product availability and the best price, access to specialized niche providers around the world,

communications with other buyers of the same product for information and troubleshooting, electronic auctions, instant aggregation of independent buyers to obtain quantity discount, easy input for custom configurations, instant voice access to sales assistance personnel, and tracking of delivery status, to name just a few of the existing and emerging capabilities. Photo-like screen resolutions for product images, rapid access speeds, and always-on shopping are becoming increasingly available.

Chain Store Age (1999) notes that shifts in the balance of power and information between sales staff and consumers drive online buying in automobiles, real estate and securities, and that comfort and privacy are also strong motivators in certain categories, such as men buying ladies' underwear.

Influential reasons for people resisting online buying are now continuously researched. A 1999 list from a recent survey by Harris is seen in Table 2-12. The top two problems, credit card security and misuse of personal information, are being actively addressed by the on-line industry. The other three are subject to amelioration through innovations by retailers that augment in-store services and integrate them with online activities.

Table 2-12 Influential Reasons for Not Buying Online

Credit card security	72%
Retailer misuse of personal information	63%
Like to touch/feel/see products	59%
Like to get ideas by browsing	50%
Better sales in stores -- pricing and selection	48%

Source: 1999 Harris Survey reported by www.emarketer.com

There is at the moment a fragmentation of electronic shopping and in-store shopping; different organizations do them, even within the same company. The gap will likely be eliminated as successful retailers merge on-line and in-store services, a joining that may come to be known as "clicks and mortar," as coined by David Pottruck, co-CEO of stock brokerage Charles Schwab (Weber 1999). When both worlds are merged in a particular retail enterprise, customers will be able to order electronically at home or in the store, be able to receive goods by delivery at home or in person within the store, and be able to return unwanted goods at the store or by mail.

We see three broad patterns of behavior in electronic shopping, with travel implications for each (cf. Gould 1998):

Pattern 1: On-line Research and Ordering, But Travel for Fulfillment

People use the Internet to research what they want to buy and to learn the location of a store or service facility (such as a restaurant or wristwatch repair shop) they can travel to in the usual way to complete the purchase. This process may or may not include ordering the item (such as a pizza or item of furniture) ahead of when they arrive at the store or service facility. A trip may occur

immediately after the online shopping, or may occur some days later when something that was ordered remotely is available for pick up, installation, or other appropriate order fulfillment. The travel effects of this pattern are mixed. Trip-making may be reduced because electronic research is substituted for in-store browsing at multiple locations. Or, on-line research may lead to more travel because shoppers become more aware of widely scattered consumption opportunities.

Pattern 2: On-line Ordering and Commercial Delivery

Increasingly, consumers order the item through the Internet, or through a telephone call, and then have the item delivered. Next day delivery is sometimes possible. This sequence is the typical process in electronic shopping and is analogous to ordering through a mail order catalog, which has peaked at about 4 percent of retail sales in the US (Gould 1998). UPS and Federal Express are both engaged in new business initiatives that provide fulfillment services for Internet retailers.

The travel effect of Pattern 2 seemingly includes one or more fewer store visits, but it may be that consumer research ahead of the purchase transaction (such as visiting several home electronics store to check prices and see the performance of multiple television sets) leads to just as much or more consumer travel in some cases. Furthermore, the home delivery scenario includes more truck activity on the streets near people's homes. More just-in-time package delivery by competitive systems of partially-loaded trucks (from FedEx, United Parcel, and the Post Office as well as OfficeMax, Sears, and Homegrocer.com to name just a few) may not prove to be inherently more travel-efficient than shoppers driving to stores and bringing home what they want.

Pattern 3: On-line Ordering and Electronic Delivery

Certain items and services can be delivered electronically through the Internet or Cable TV; for example, computer software, the new electronic books that load into hand-held readers, greeting cards delivered to ultimate recipients via e-mail, pay-per-view movies, and postage from the US Post Office. Services that can be delivered electronically include travel arrangements, counseling, resume and other document preparation, home appliance monitoring for necessary servicing, and banking. Furthermore, in perhaps 30 years or less, serious designers already working today may perfect and deploy molecular assembly techniques that permit certain relatively small three-dimensional objects (like miniature computers and wireless telephones) to be delivered through the Internet. In general, electronic ordering and delivery would seem to yield mostly direct travel savings.

Other Travel Effects

It is probable that the entire physical structure of retailing and the logistics systems behind it will evolve in response to the capabilities of the Internet and the response of consumers and entrepreneurs to the Internet. For example, if on-line ordering and home delivery becomes increasingly popular, physical stores may respond by becoming larger (or smaller), and more numerous (or less). For example, large chain bookstores, and now Amazon.com the electronic

bookstore, have clearly made small independent bookstores less viable, and many have disappeared. As a speculative example of structural change, if body imaging and custom clothing manufacture arises, a physical infrastructure of relatively small neighborhood clothing stores may emerge as locations for body scanning and final product try-on and acceptance to take place. All developments like these are likely to incrementally modify consumer travel patterns for shopping.

Existing and new shopping malls have already begun to establish themselves as entertainment destinations in order to draw shoppers who could otherwise buy mall goods through Web storefronts. Even electronic shopping itself can be provided by a mall: Whatever quality and speed of computer access the average consumer has at home in the year 2010, a large retail institution surrounded by free parking may well be able to provide a better electronic alternative (huge viewing screens, faster access via supercomputers to virtual reality environments, free food and drinks, a comfortable couch for two to sit side by side, instant delivery of goods instead of next day) for the consumer who wants to leave home for her or his on-line shopping.

Electronic shopping is nowhere near its technological limits. It would appear that there are many years of growth in consumer utilization ahead, although the impact on the amount of travel for store shopping is still quite unclear because of technological developments and entrepreneurial business initiatives yet to unfold.

The analysts closest to the Internet and retail industries are generally unprepared and unwilling to forecast the evolution of electronic shopping beyond 5 to 10 years in the future. To avoid misdirecting transportation resources, government-led land use and transportation planning processes will of necessity need to be aware of a range of potential changes coming from the growth of the Internet economy and conversant with alternative scenarios for what electronic shopping likely means to the interaction of consumer behavior and retail industry behavior.

DISCUSSION AND CONCLUSIONS

The new marketplace is characterized by considerably more variety and opportunity for consumers who now have a much larger array of choices for their household needs, leisure-time pursuits, and other personal activities. In terms of retail structure, this has translated to larger and fewer retail store formats in any one category, at the same time the number of individual categories has greatly increased. Some retailers have taken advantage of consumer demand for more choice and good values by inventing new formats and offering a wide scope of products. Others have carved niches from older store formats while expanding product offerings. Table 2-13 summarizes some current national trends in the size, number, variety and spatial dispersion of stores (Nelson & Niles 1999b). Equally important trends are apparent in the consumer services and recreational sectors.

From a transportation perspective, the most important aspects of the new store formats is their number, spatial distribution, and spatial organization, i.e., their siting with respect to other stores and to older centers of retail activity. The number of trip generators has expanded greatly, much

faster than population. At the same time, retail's spatial structure has changed in ways that both increase and decrease travel. One trend is to one-stop shopping, either within an individual retail unit that offers a wide range of goods and services, or as a result of the spatial clustering of

Table 2-13 Major Trends in Retail Structure

Retail activity increasingly polycentric and dispersed
Planned shopping centers dominate market
Smaller malls cluster around major malls
“Big Box” market share growing
“Super” stores growing in kind and number
Many chains prefer stand alone sites
Drive to and through convenience growing

Source: Nelson & Niles 1999b

several separate units. The result in the latter case can be very large retail concentrations such as those found at regional malls. Another trend is to isolated locations. While some retailers prefer to cluster, even with their competitors, other retailers choose stand-alone sites that provide greater visibility, access, and control over hours of operation, which increasingly are 24/7--24 hours per day and 7 days per week.

Figure 2-6 attempts to represent schematically the household travel patterns generated by the new retail structure. Obviously, individual household patterns will differ greatly. And a simple diagram cannot begin to suggest the complexity of actual travel patterns that are integrated over the population and time. Even the frequency of travel from one household to specific locations is not easily captured in one diagram. But the schematic is instructive in that it does provide a sense of the increased number of retail destinations, their spatial relationships, and how high levels of mobility and accessibility enable trips to multiple centers and stand-alone sites dispersed across a metropolitan region. It also suggest how chaining of trips improves the efficiency of travel.

Although past trends suggest future realities, the retail marketplace can be expected to continue to reinvent itself in new ways that are difficult to predict. A good example is online marketing. E-commerce is currently a small fraction of all retail sales, yet it has a large and unknown potential, and an equally large possible impact on personal travel patterns.

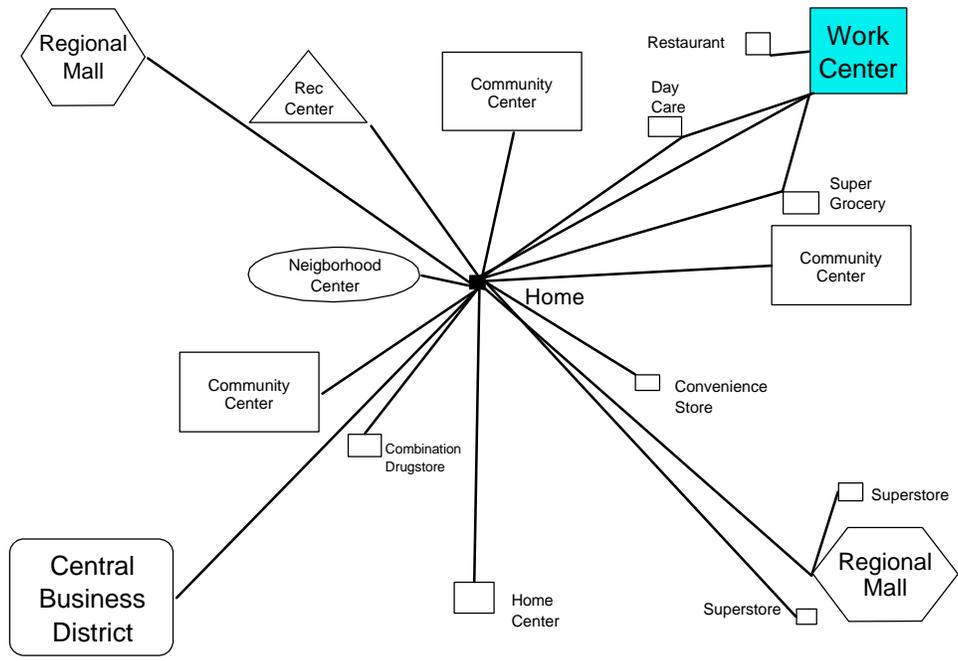


Figure 2-6 Hypothetical Household Nonwork Travel Patterns

CHAPTER THREE

DEVELOPER, RETAILER, AND CONSUMER DECISION DYNAMICS

INTRODUCTION

In this chapter we consider the chief factors that have been instrumental in shaping the modern metropolitan retail environment. These factors help explain the observed spatial structure of the retail marketplace, including the size of individual stores, their siting at particular locations, and their spatial relationships to other establishments. They also explain why the retail structure appears to be successful, i.e., why consumers patronize the stores, how it attracts their discretionary spending, and how their response in turn helps shape the retail environment. This synergistic relationship between the interests of developers/retailers and consumers is an essential determinant of nonwork transportation patterns. These factors are explored in more detail in Chapter 5 in the context of retail site location decision making and travel demand modeling.

THE CHANGING RETAIL MARKETPLACE

As we have seen in Chapter Two, dramatic changes have swept across the retail marketplace. Retailers today, more than ever before, are running their businesses based on a financial planning approach rather than a merchandising approach. A strong economy throughout the 1990s and resulting available investment capital has meant growth in the size of retail firms and resulting monopolistic and oligopolistic behavior. For example, in 1992, the top five supermarket chains had 19% of the national market; in 1999 that share grew to 33% (Bergmann 1999). Merger activity is high. Hence the increased importance of larger, national chains in the marketplace.

Investments by larger firms in information and other technologies have caused advancements in manufacturing and logistics to the point that cost of goods and the physical distribution to the store are a shrinking share of the cost of consumption. The main problem faced by firms serving consumers is that of marketing against competition. For retailers, store location is paramount, and planning multiple store sites in a regional market has become much more sophisticated, as will be shown in Chapter 5.

Power in the market has shifted to the consumer and in turn to retailers who are closer to the consumers and are aware of their needs. One need is time saving. Thus as society becomes more affluent, the time constraint is replacing the income constraint in the allocation of goods. Increasingly, people buy goods and services that save time which is then allocated to other activities.

The trend toward increasing polarity in retailing continues. On one hand, superstores emphasizing large-scale diversified operations and logistical efficiency take a larger share of the market. On the other hand, firms that emphasize deep but narrow product lines and more

responsive consumer services grow in importance. As the share of the market of both types increases, the share of firms in the space between these two poles shrinks.

Social institutions, such as the family, the work place, and the school, are in charge of shaping consumption and are directing and constraining both the times and nature of activities. Social institutions similarly influence the choices that consumers make among major product categories associated with activities.

RETAIL STRUCTURE FACTORS

Table 3-1 lists the chief factors that are involved in the land developer's and retailer's choice of size of retail unit, and the general location and specific site selected for the unit. We briefly describe each of these factors.

Table 3-1 Key Retail Location Decision Factors

Scale and scope economies
Agglomeration economies
Visibility, access and parking
Environmental impacts
Zoning and public resistance
Local government revenue needs

Scale and Scope Economies

Economies of scale are the most visible manifestation of the new retail economy and structure. Many classes of retail firms are building larger stores that attract customers from a larger geographic market area. Even stores that have been traditionally a part of neighborhood retail centers, and that remain so today -- groceries, barber shops, pharmacies, book stores -- have scaled up. Some retail formats have reached a market size that requires a store area, including parking, that would be a difficult fit in a core commercial center such as a downtown. These include "big box" retailers -- discount department stores, warehouse club stores, home improvement centers, and other "category killers" -- that generate large numbers of trips for many hours of both week days and weekends. Most customers arrive by car which enables them to conveniently haul purchased items that are heavy, bulky, or numerous.

The growing size of market areas is obviously related to the greatly increased regional accessibility that personal vehicles and modern urban roadway systems provide. Some retail centers -- e.g., ethnic and lifestyle shopping districts, factory outlet malls, major recreation venues -- may be dependent on a market that extends across a metropolitan area. Even regional shopping malls generate a considerable amount of "cross shopping," i.e., shoppers live close to one mall but also frequently shop at other regional malls.

Large stores and their lower prices are also very much facilitated by modern information technology, including bar-code price scanners to keep checkout lines moving, point of sale terminals wired to inventory management systems and credit/debit card networks, and global logistics management systems connecting stores to warehouses and factories worldwide. Another information technology issue driving the construction of some types of larger retail stores is the necessity of competition with the large inventories and low prices available in mail-order and on-line electronic shopping. This is true in books and computers, for example.

Even the convenience store, which has replaced the “mom and pop” neighborhood grocery as the nearest place to purchase food, bottled drinks, and tobacco, has achieved a market scale that creates a difficult fit except in locations at the edge of a residential neighborhood. Most convenience stores are on busy arterials, and their customers are drawn from a large trade area.

Agglomeration Economies

Clustering has long been a feature of the retail marketplace. Competition leads simultaneously to competing stores positioning themselves geographically into clusters and to similarity among products (Hotelling 1929). Retail firms also tend to locate in close proximity to other firms that offer complementary goods (Jones & Simmons 1990). The clustering of competitors facilitates comparison shopping; the clustering of different kinds of stores facilitates one-stop shopping. In both cases, clustering benefits both the retailers and their customers. Total travel distance and cost are reduced, and positive externalities are created, i.e., a total market that is greater than the sum of the individual markets when the same stores are not clustered. Agglomerations also offer retailers the benefit of reduced overhead. Parking is shared, as are other costs such as security and even advertising.

Clustering occurs at several levels: in central business districts, regional malls, outlet malls, and smaller malls and retail strips along arterials. Clusters involve services as well as retail stores, e.g., post offices, libraries, banks and ATM machines in shopping centers and malls. A rising form of retail cluster is the “power center”, which typically brings together a warehouse store, home improvement center, a major electronics retailer and other smaller stores offering goods and services. The mix of stores is usually subject to careful selection to maximize cumulative attraction and impulsive purchasing.

Fast food outlets cluster with department stores in regional malls to take advantage of high pedestrian flows generated by their neighbors. Restaurants also cluster. Pilsbury concluded, after an extensive study of the Atlanta-area restaurant industry, that clustering was the most important factor determining restaurant location (Pilsbury 1987). According to Pilsbury, this “competitive linkage” strategy has produced an almost total clustering of restaurants in most communities in Atlanta.

The retail marketplace continues to reinvent itself. A recent development is the “stacked entertainment zone,” that may include restaurants, food courts, cinemas, ice rinks, video game

arcades, art galleries, and spas. These highly diverse activity assemblages have replaced the department store as the destination anchor in some shopping centers.

Visibility, Access and Parking

All stores seek visibility to attract customers and to provide convenient access to the site. Since the car is the dominant mode for shopping trips, many retail chains prefer stand alone sites on major roads and at key intersections. Such sites serve to project the image of the company and to support its advertising, and they provide convenient site access, entrance and egress, and parking that is free from competition from other activities. Compared to a shopping mall location, freestanding stores control their own business hours. They can be open to customers around the clock. Stand alone sites also allow retailers to grow at faster rates than through traditional shopping center development.

Environmental Effects

Quite apart from the vehicle traffic consequences caused by large size, certain stores are difficult to site next to residential areas because the activity generates noise, high volumes of refuse, or just looks bad. These include modern grocery stores, auto repair services, funeral homes, and operations like craft stores and brew-pubs that have manufacturing or processing operations just behind the customer counters.

Zoning and Resident Resistance

In previously developed areas, current zoning is a central political issue for realization of restructured neighborhood retail. Residents resist rezones that allow more mixed-use development. Efforts to introduce commercial businesses into existing residential areas, even when not requiring zoning changes, often meet opposition. Expansion of commercial activities is more probable in commercial zones that have underutilized capacity. It will tend to take the form of the existing commercial center, which is most often an arterial strip.

Local Government Competition

Local governments generally see commercial development as a net tax revenue generator compared to even dense residential development, and are inclined to being receptive to the siting of major retail stores and complexes. Some local governments provide incentives to attract developers who are looking for a site and who can choose among locations within a large trade area.

CONSUMER BEHAVIORAL FACTORS

Several key behavioral traits of consumers that have travel implications are listed in Table 3-2.

Table 3-2 Key Consumer Behavior Factors

Bargain hunting
Comparison shopping
Preference for variety
Destination flexibility
Schedule flexibility

Bargain Hunting

Competition attracts price-conscious consumers to travel outside their neighborhood, trading higher travel and time costs for lower-cost merchandise. This is particularly the case when consumers are familiar with the goods they seek and are responding to regional advertising. Newspapers typically carry advertising inserts describing low-priced goods available only in big-box superstores and off-price retailers sited throughout a metropolitan region.

Comparison Shopping

Although all stores generate some measure of non-local trips, some business activities (stores selling furniture, major appliances, or automobiles) generate higher levels of longer, “comparison” shopping trips, i.e., customers will bypass other similar stores to shop there. Competition for customers provides a mixture of price, quality, variety, and service choices.

High levels of comparison shopping have been observed on a regional scale. Although large malls in the same metro region may have the same anchoring chain stores, they may also differ in their mix of specialty stores. Some may have a more upscale mix compared to the regional average. This tends to produce what has been termed “cross shopping”, with some consumers consistently shopping at two or more regional malls. Cross-shopping patterns have been measured regionally through on-site surveys.

Preference for Variety

People will pay more in travel costs to find variety or a unique shopping experience. For some, shopping is a recreational activity, and “satisfaction” is a large component. Malls that include food courts, multi-screen cinemas, amusement rides and electronic game parlors, concert stages, traveling festivals, and fashion, automobile, hobby, and crafts shows are playing to this preference. These venues and events are typically designed to draw customers and their family members from a large trade area well beyond walking and biking distance.

Bargain hunting, comparison shopping, and preference for variety all show up in a 1999 telephone survey of 600 U.S. female consumers by market research firm WSL Strategic Retail, “How America Shops 2000.” From 1995 to 1999, the number of weekly shopping trips held steady at 3.5, but Americans have doubled the number of stores visited, from 1.4 to 2.9 across the

same period of time. "Consumers view shopping as part necessity, adventure, pragmatism, and emotion," reports the survey firm's president Wendy Liebmann. "Excellent service is important (91%), as is convenience (85%), and lowest price (75%). Then adventure and emotion come into play. Two thirds (66%) agree they are sale shoppers; 64% bargain hunters; half (53%) like to browse; (50%) see what's new and interesting." [Prepared Foods Online Newsletter, 2000]

Location Flexibility

Choice in the marketplace allows travelers to adjust to changes in the cost of a trip. For example, to avoid congestion or to combine several travel purposes in a chained trip involving one invariable destination (for example, grandma's house), consumers can access the same retail store at another location without increasing the time or direct cost of the trip.

Schedule Flexibility

Consumers exhibit considerable flexibility in the time scheduling of trips to retail activity centers, often made possible by extended store hours, especially in seasons like Christmas and summer. Nonwork trips combine with trips to and from work, and they originate from work sites. Tours involving one or several nonwork activities typically occur after work hours and on week ends.

ALLOCATION OF HOUSEHOLD EXPENDITURES

One way to see how the retailer and consumer dynamic has played out over time is to track consumer spending patterns. Table 3-3 indicates changes in the distribution of consumer expenditures over the past four decades. Consumers are allocating their disposable incomes to different sorts of goods and services (Robicheaux & Harmon 1997). Particularly large allocation shifts have occurred in food, clothing, and recreation spending.

Table 3-3 Average Household Consumption Expenditure Distribution (percent)

	1960-61	1972-73	1987-88	1993-94
Food	24.4	21.2	17.0	16.4
Food at home	19.6	16.5	9.7	10.2
Food away	4.9	4.8	7.3	6.2
Housing	29.0	31.4	35.5	36.5
Clothing	10.3	8.2	5.9	5.3
Transportation	15.2	22.0	22.4	21.6
Medical Care	6.7	5.4	5.5	6.5
Recreation	4.0	4.7	5.6	5.7
Other	14.3	11.8	13.8	13.7

Source: U.S. Department of Labor

MAJOR TRENDS WITH TRANSPORTATION IMPLICATIONS TO WATCH

Changing American Cultural Landscape

Demographers predict that by 2010 more than 1/3 of Americans will be Black, Asian, or Hispanic. And by 2030, nearly 40 percent of the population will be nonwhite. To the extent that preferences are for goods and services reflect ethnicity, the growing cultural diversity may produce more specialization and differentiation in the marketplace.

Babyboomers' Growing Older

Much of the change in consumer spending patterns over the last 30 years has been attributed to the lifestyles and preferences of the “baby boomers”, persons born in the 20 years following WW II. Between 1995 and 2005, the segment of the population aged 40 to 60 will increase by 60%. In the same period, the 20-30 age segment will decline. By 2020, the number of people age 55 and above will reach 29% of the population. There has been much speculation regarding the consumption patterns of these retirees and whether they will continue to determine the trend lines. Some researchers answer yes, suggesting that demographic and lifestyles shifts that drive shopping behavior tend to be gradual and long-lasting (Du & Apfel 1995).

CONCLUSIONS

A number of strong economic and political forces have combined to shape the retail structure of metropolitan areas and the nonwork travel patterns of their residents. Consumers who appreciate variety and good values have responded favorably to economies of scale that produce larger store units offering a wide selection of goods at lower prices. The market in turn has reacted to the need for more flexible locations and hours of operation that more closely fit the increasingly varied household schedules. Store locations and their spatial organization has not been constrained by political limitations, and developers and retailers have been generally free to site stores where they are most profitable. Their freedom to locate has been indirectly assisted by residents who, being very protective of existing residential zoning, are not critical of the retail strip and the retail clustering that are the bane of planners, and by competition among local jurisdictions for tax revenue generated by retail sales. Consumers are apparently willing to spend more of their discretionary income on transportation to access the great variety of offerings now available in the marketplace.

CHAPTER FOUR

CAUSES OF NONWORK TRAVEL GROWTH

INTRODUCTION

Although the NPTS and regional surveys have documented the large and continuing increases in several categories of nonwork trips since the late 1960's, there have been surprisingly few investigations into root causes. Researchers have suggested various reasons for the growth of nonwork travel: changing lifestyles, a greater proportion of women in the work force, and the decentralization of housing and jobs that has reduced commute time, allowing time saved to be used for nonwork pursuits.

In this chapter we review these studies and suggest why they provide an incomplete causal understanding of nonwork travel growth. As we have indicated, activities generating nonwork trips have also changed remarkably in the past few decades. There are considerably more opportunities and choices than ever before to shop, purchase services, and engage in recreation and other leisure activities. We propose that a more complete understanding must take into account the change that has occurred in the consumer marketplace over the same period.

GORDON, KUMAR, AND RICHARDSON'S HYPOTHESIS

A decade ago, Gordon, Kumar, and Richardson (Gordon, et al 1988; Richardson 1989), here after GKR, using the results of the 1977 and 1983 NPTS, spotlighted the rapid growth of nonwork trips and the importance of this phenomenon for metropolitan transportation and land use policy. While suggesting that life style changes had contributed to more nonwork travel, and after rejecting several other possibilities, they speculated that the vigorous growth of nonwork travel was primarily the result of decentralization. Suburbanization of both households and jobs, they asserted, had made possible shorter work trips. This, and the ubiquity of a wide range of commercial and service facilities in the modern suburb, had reduced travel time and distance and thus generated more opportunity for leisure pursuits.

A BROADER RANGE OF REASONS

Decentralization still stands today as one plausible contributor to the growth of nonwork travel. But for a number of reasons, we would expand the list of contributing causes for the large growth in per person trip frequency for several sub categories of non work travel. We reach this conclusion after a closer look at the older NPTS data, the concept of a personal travel time budget, and the dynamic changes that have occurred in the consumer marketplace. We start with a review of causes that have been discussed previously by GKR and others. We also suggest other possible causes that must be considered speculative until more research is done.

Lifestyle

GKR acknowledged that many “lifestyle” changes may have contributed to more frequent and more regular nonwork trips. They cited more meals eaten outside the home, frequent visits to health clubs, and increased utilization of outpatient clinics as examples. Although these are clear reflections of a changing marketplace, they are only the tip of a veritable iceberg of fundamental changes that had begun before 1977 and continue today. Rather than expanding their inquiry to include the evolving consumer demand for new products and services and the market’s response, GKR instead choose to offer what they called a more “systemic” reason, “spatial organization,” to explain the trend to more nonwork travel.

Suburban Maturation Equals More Free Time

Based on NPTS trip volume data, GKR observed that nonwork trips had apparently grown to a much greater degree in suburbs than in central cities between 1977 and 1983, across a range of Standard Metropolitan Statistical Area (SMSA) sizes. This evidence lead them to conclude that the cause of nonwork trip growth was the rapidly maturing suburban land use pattern, i.e., commercial areas being added in proximity to residential areas. They reached this conclusion by comparing total person trip volumes, and by calculating percentage changes in volume over the six year period for the two areas. No attempt was made to control for differentially changing population inside and outside central cities of a SMSA. Indeed, many central cities were losing population relative to their suburbs in the 1970's and early 1980's. This phenomenon was reflected in the NPTS data (GKR, Table 2, p.420) which showed dramatic declines for work trip volumes inside central cities.

When daily person trip frequencies (GKR, Table 6, p.423) are employed to calculate percentage changes, the differences between central cities and suburbs are much less dramatic: growth in nonwork trips for the period 1977-83 was only slightly greater for residents of suburbs compared to central cities in SMSAs of the same size (Nelson & Niles 2000).

GKR implicitly invoke the concept of a travel time budget when they suggest that the more efficient spatial patterns in developing suburbs reduce trip costs (time and distance) and thereby free up time for more nonwork travel to engage in leisure pursuits. The existence of a relatively constant travel time budget has been proposed (Zahavi 1980). Other evidence indicates that people treat travel time as a part of their personal or household daily activity time budget, and that they tradeoff travel time with both in-home and out-of-home activity time (Supernak 1984, Levinson & Kumar 1995). More time will be expended in traveling to engage in more nonwork activities if there is utility inherent in those activities. And the more choices that are available, the more nonwork trips, VMT, and time spent traveling can be expected.

Income

To investigate whether the propensity to make more nonwork trips was a function of income, GKR stratified trip frequencies by purpose and household income for each SMSA size and residential location. They found that higher income households tended to make more trips of all

kinds, but that the increase in nonwork travel from 1977 to 1983 was common to all income groups, whether they lived inside or outside central cities and regardless of SMSA size. GKR concluded that income effects were not responsible for the growth in nonwork travel.

But what if increasing income itself allows people to take more trips, especially to shop, eat out, and engage in leisure activities? Instinctively, the answer is that it should. Then the question is whether income was increasing across all income levels in the measurement period? In the six-year period from 1977 to 1983, real (constant dollar) disposable income (including both earnings and transfer payments) increased 8 percent and real personal consumption expenditures increased 7 percent (U.S. Bureau of Census 1998). These were sizable gains that may, in part, account for the observed increases in nonwork travel, especially for the family and personal business and social and recreational categories. More study would be required to establish the exact relationship between increasing income and nonwork trip frequency.

Growth of Employed Women

GKR also considered the possibility that the growth of female employment was responsible for some of the growth in nonwork travel. Women with child-rearing responsibilities who enter the work force may have made more trips to daycare facilities. However this possibility could not be tested because the trip purpose data was not separated to this level. GKR found that, generally, women in different categories, whether or not heads of families with young children, exhibited little variation in nonwork travel behavior.

Household Size

Another idea explored by GKR is that demographic changes, in particular decreasing household size, could explain the growth in nonwork travel. These researchers suggested that larger households make fewer trips that might, for example, combine shopping with giving a ride to a family member. They discounted this reason since their analysis of nonwork travel growth was based on individual trip data. However, the significant decrease in average household size that began in the mid 1960's and only began to slow in the mid 1980's might be a factor contributing to the observed growth in some categories of nonwork travel. (In the period 1969 to 1995 average household size dropped 17 percent, from 3.16 to 2.63.) For example, industry data indicates that while grocery shopping is a shared responsibility, men and women who head the same household shop together only about 9 percent of all trips made to the store (Progressive Grocer 1999). Most grocery shopping trips are made singly by the female head.

Demand Responds to Supply

GKR also explored the possibility that the observed increases in nonwork travel was a response to increased supply, i.e., more highway capacity. They point out, however, that highway mileage increased by 12 percent from 1977 to 1984, much less than the observed increase in nonwork trips. Yet it also seems apparent that added roadway capacity, whether highway miles or lane miles, will increase accessibility to a wider range of nonwork activities that are available within a

metropolitan region. Increased supply, then, can't be easily discounted as a factor that explains nonwork travel growth.

More Vehicles and Drivers Per Capita

Household vehicles and licensed drivers grew substantially in the period 1969-1995, by 143 percent and 71 percent, respectively. This compares to a 32 percent increase in population. These additional cars and drivers may have contributed to the disproportionate growth of nonwork travel. If more cars are available to a household, it's possible that they will be used for nonwork trips that might not otherwise have been taken because no household vehicle was available at the time the person desired to travel. Going from one to 2 to 3 cars is a big jump in available household mobility that is likely to get used on trips that are more discretionary than not. This may be more true for teenagers than others.

Mobile Communications Technology

The growth of cellular telephones in cars may also be factor in recent travel behavior. Clearly, the ability to receive and make calls could unleash additional trip making. Someone so equipped would be much more willing to leave the office during the day, knowing that she will not be out of touch. This can mean running errands during off peak that may have previously been saved for peak and perhaps combined with other activities in a chained trip.

Fuel Efficient Vehicles

Berkowitz, et al (Berkowitz 1987), cited by GKR, suggested on the basis of Canadian data that more fuel-efficient vehicles had stimulated the growth of nonwork trips. Average new car fuel economy was increasing rapidly (by 39%) in the 1977-1983 period. However, GKR found that the increased number of nonwork trips was associated with a decline in total VMT, which is a contrary to the expectation that lower fuel costs would increase distance traveled. The hypothesis is also complicated by the fact that gasoline prices at the pump (and in constant dollars) increased rapidly from 1978 to 1981, before beginning a fall that continued to 1987. However, the cost of fuel, being both a highly visible and variable cost of travel, could be expected to have some impact on the most discretionary nonwork trips.

CONCLUSIONS

Changing lifestyles, as suggested by GKR, provide a plausible and partial explanation for nonwork trip growth, but it is not a simple cause and effect relationship. Lifestyle changes, or consumer preferences, have to be understood as both dependent and independent variables in a dynamic process that involves consumer demand, technological change, and market innovations as depicted in Figure 4-1. Feedback linking consumer preferences and business-driven innovation to serve and expand those preferences is an inherent aspect of a modern, capitalistic market system. Opportunities generated by expanding wealth and technological innovation stimulate the market to offer even more variety and choice.

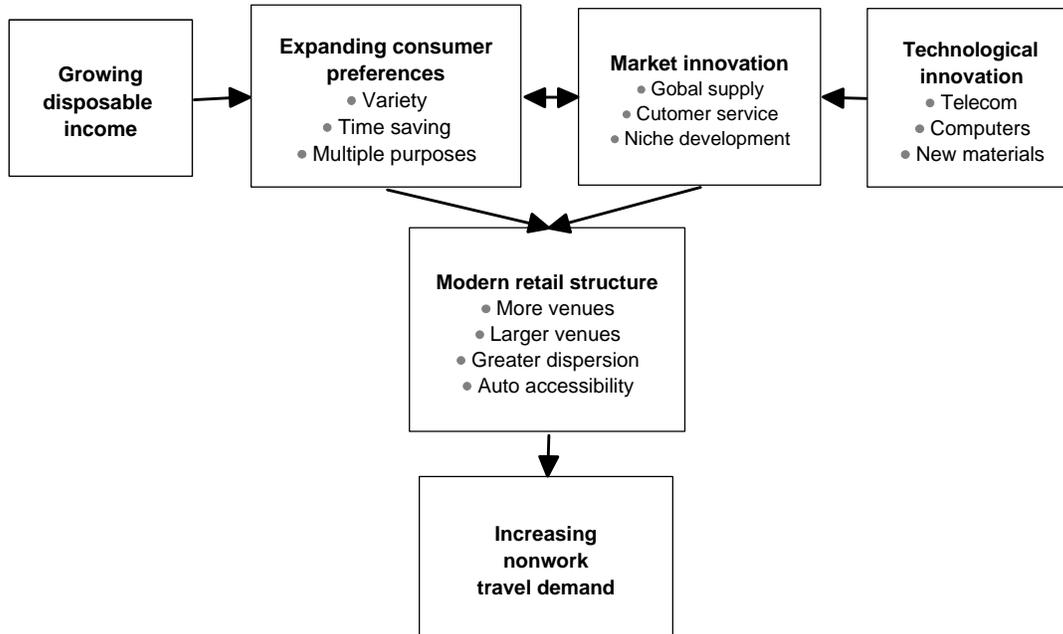


Figure 4-1 Model of Consumer Behavior, Retail Structure, and Nonwork Travel

All of this plays out in the spatial realm of a metropolitan region, whether inside or outside the central city. New trip attractors are continually being added that change personal and aggregate travel patterns, both increasing the number of nonwork trips and VMT. People organize their trips into complex tours that allow efficient access to the increasing numbers of destinations, while minimizing trip time and distance within their activity budgets.

Commercial vehicle travel increases in proportion to the expanding niche markets for goods and specialty services, and for the fast, just-in-time schedules required by the new economy. More retail locations, more kinds of goods, more market competition, tighter inventory control, higher service levels, and more home services would all stimulate a growth in trucking along the lines observed. Home delivery of goods ordered through the Internet is now on a high growth path as well. Commercial vehicle trips may increase even more in the future as online markets grow and diversify.

Where the saturation point is for the number of personal nonwork trips is hard to predict. Apparently, we have not yet reached it. Certainly a broader distribution of wealth will tend to increase nonwork person trips, as will retail market innovations that provide even more consumer

choice. But there are other factors, including online marketing, that may tend to play in the other direction and reduce personal nonwork travel. These and other uncertainties, the result of a intricate activity and travel environment, require new approaches to nonwork data collection, trip forecasting, and related planning (Niles & Nelson 1999 a & b; Nelson & Niles 1999a). Benefits could result in the form of more cost-effective transportation investments and supportive land-use strategies.

CHAPTER FIVE

MODELS OF RETAIL STRUCTURE AND NONWORK TRAVEL

INTRODUCTION

We now turn to the tools used by planners to estimate and forecast nonwork travel. Our interest is in comparing the models and other analytical methods used by both private sector retail site location planners and public sector transportation system and land use planners. Although their motivations differ, both must predict the response of people to changes in the land use pattern. In the case of the retail planner, the hoped for response is that customers will be attracted to a new retail location (or locations) in sufficient numbers to ensure its profitability. If most customers are assumed to arrive by car, this can obviously mean selecting only locations and sites that have high levels of private vehicle accessibility. Sites are chosen for their convenient ingress and egress, provision of sufficient parking, and proximity to major arterials or regional highways.

For the public agency planner, the typical problem is to outline a land use and public transportation investment strategy that will change the overall personal travel patterns in ways that encourage use of alternative modes and that decreases congestion and related environmental impacts. Our concern is to what extent are these approaches at cross purposes, and how might they be reconciled.

Also of interest is the planning horizon, and its relationship to the complexity and unpredictability of modern society. Every business probably hopes to remain viable and profitable in its chosen concept and format for a very long time. Yet the reality is that consumer tastes and habits can be expected to change, often very quickly, and this, along with continuous technical innovation, means that the retail landscape will also inevitably change in its spatial dimensions. Businesses clearly need to prepare for this change.

In contrast, planning for public transportation appears to assume long term predictability of land use and human activity patterns. This usually involves the belief that there will be long-term benefits that payback major up front costs in new public transit capacity. Indeed, proponents of transit-oriented development often point to the expected increases in transit ridership that will accrue as land use becomes progressively more dense, perhaps in response to a significant increase in the cost of operating and owning a private vehicle.

There is not space here to more than outline some of the differences between retail models and land use/transportation models, and to suggest some of the issues that need to be addressed if public planning for nonwork travel is to realistically take into account the dynamics of the retail marketplace. We begin with a short review of the classical basis of retail modeling.

CLASSICAL THEORY OF RETAIL STRUCTURE

First outlined by the German researchers Christaller (1933) and Losch (1938), and confirmed by numerous empirical studies of urban and rural areas in the United States (e.g., Berry 1958; Berry 1988; Morrill 1987), the central place theory of retail structure has been used to explain the structure of the retail environment.

Central place theory suggests that retail structure is organized as a hierarchy of centers with diminishing levels of retail intensity from top to bottom. As applied to metro areas, the downtown of the central city lies at the apex of a retail supply cone. Below it are shopping centers of descending size and order from large district centers to small neighborhood centers. Shoppers can meet an increasing number of their needs and wants as they move up the hierarchy, with each succeeding level providing everything and more than is available in the level below. Only the central city downtown supplies most of people's demand for goods and services.

The theory of central places suggests that the centers are organized by size, market area, and the type of goods sold. Small centers serve small market areas, and have small stores that sell "convenience" goods, such as groceries, at high volumes. Larger centers serve larger market areas which, in the case of the downtown, may be the whole region. Stores tend to be larger, such as department stores selling "shopping" goods, and depend on less frequent sales to a much larger number of people. By implication, travel distances are minimized for access to goods and services under the theory.

CENTRAL PLACE THEORY AND TRANSIT-ORIENTED DEVELOPMENT

Interestingly and not surprisingly, central place theory fits closely with the orderly vision of transit-oriented development, as described by Peter Calthorpe, a leading developer of the idea. Calthorpe (1993) suggests that the size and mix of uses in the core commercial area of a TOD could vary depending on the available space, location, and overall function of the site in the region. He identifies four types of core commercial centers with a range of sizes:

- Convenience Shopping and Services. This is the smallest center with an under-roof area of 10,000 to 25,000 square feet, with perhaps 3 to 10 stores or service businesses.
- Specialty Retail Center. Although Calthorpe does not specify the types of specialty stores, presumably they might include ethnic food stores, restaurants, fashion clothing, etc. Specialty retail centers would range in size from 60,000 to 120,000 square feet.
- Neighborhood Center. Neighborhood centers would occupy 80,000 to 140,000 square feet, and would contain a supermarket, drugstore, and convenience uses.
- Community Center. The largest centers, 120,000 square feet and greater, would serve both the demand for convenience and shopping goods. They would have a department store, and the core area might contain non-retail employment-generating uses.

Each of the four types of commercial areas would be linked with the others with a transit system configured to be oriented to the hierarchy, that is, a hub and spoke arrangement. Community centers would be the main hubs (downtowns, so to speak) and neighborhood and specialty centers would be on rail lines that radiate outwards from the community centers. Convenience shopping would be within walking distance of every home in the ideal urban configuration, and linked by bus service to train stations at neighborhood and specialty centers.

EFFECT OF MODERN RETAIL ON HIERARCHICAL STRUCTURE AND TRAVEL

Over the half century since the central place theory was developed, urban mobility and accessibility have increased greatly with improvements in roadways and personal vehicles, especially their now almost universal ownership and availability. Two interrelated questions arise: 1) how much has the increased accessibility affected the retail hierarchy, and 2) how much has the increased accessibility and changes in the hierarchy affected the patterns of travel for retail purposes?

Muller (1995) suggests that the region-wide highway networks built during the 1950's and 1960's radically changed the accessibility equation of metropolitan regions, because it eliminated the centrality advantage of the central city's CBD. After about 1970, most destinations in a large metro region could easily be reached by motor vehicle.

The most obvious spatial change has been the development and maturation of downtown-like concentrations near major highway intersections outside the central cities, the so-called Edge Cities as described by Garreau (1991). These concentrations provide much of the goods and services needed by the surrounding population. Some researchers suggest that classical theory has been able to explain the multi-centered urban form that continues to develop in most major metro areas, while also observing that the land use-transportation connection has weakened considerable (Giuliano 1995 a & b).

Handy (1993), however, submits that the increased accessibility engendered by regional transportation networks built after WW II instigated a collapse of the retail hierarchy by encouraging the growth of large and medium-sized regional malls and specialized centers at the expense of the downtown and small local shopping areas. "Regional malls, in other words, have become the center of public activity for many suburban communities, replacing the traditional downtown or town square of early suburban communities and shifting the focus of public life away from the neighborhood level and toward the regional level" (Handy, 1993, p 36). She shows that suburban street design principles established in the 1930s give priority to easy automobile access. This is supported by Garrison (1959) who reviewed earlier studies that indicated development of retail strips along "principal thoroughfares" as early as 1937.

In Handy's view, the changes in the retail structure have important implications for accessibility and travel. Even as convenience shopping has moved beyond walking distance, people tend to reside much closer to a full range of comparison shopping opportunities and personal services. This increases the likelihood that trips will be linked in tours, and that the total number of trips

will be less. Yet the structure encourages trips by auto, even if trips are short and there is high quality transit service, since the consumer may buy a volume of goods in any one tour. Of concern, according to Handy, is that increasing dependence on automobility will lead increasing congestion that will reduce accessibility, in a spiraling cycle that is unsustainable.

This last claim requires close examination. Have technological limits actually been reached in the management of automobile access to popular shopping and entertainment destinations? Is it important to provide complete non-auto alternatives for urban travel, or can automobility be improved through electronically managed parking and transit-based circulator systems? Are there lessons to be learned from Europe where cars are forced to follow street networks designed in the Middle Ages? Are there lessons to be learned from the Disney World and Universal Studios theme parks in central Florida, which are massively automobile dependent but move people in and out rather efficiently? Indeed, are the main problems of automobile congestion within a mile of high volume destinations, or on the freeway grids that serve these destinations? These issues will be addressed in later parts of this study.

RETAIL MODELING - SITE SELECTION

The location of a retail store -- its proximity to where customers live, work, or travel -- is a critical contributor to its economic success. The likelihood of a location being visited is reflected in its rental price.

For some smaller businesses, and for the individual store units of some large businesses, there are sufficient customers from the subset of people who walk from home, from a workplace, from a transit stop, or from their hotel. But growth-oriented retail businesses (chains and franchisers) know that the vast majority of Americans move about by automobile. This is especially true of those who have money to spend. Retailers are thus motivated to select store locations that are easy for many people to reach by driving the roads in a car and that offer ample free parking. Visibility of a store from the road by way of signage, or at least visibility in the directory for the pedestrians who have arrived in a shopping mall by car, is important.

Since mathematical modeling of transportation flows is so central to the setting of public policy with respect to government transit investments, we turn attention next to the complementary process of private sector modeling in retail site selection. Starting in the 1930s, analytical techniques have been developed to help planners in retail corporations, especially chains and franchises, and commercial real estate developers who build retail facilities to determine the best locations for retail stores. These techniques include (Ghosh 1987; Daniel, 1994):

- Regression: Development of linear or nonlinear equations that establish correlations between site attributes (such as building, neighborhood, and trade area characteristics) and site performance (such as volume, revenue, profit).

- **Trade Area Analysis:** Within a certain radius of a target site for a store, or within a set of defined polygons that are within easy driving distance of a site, this technique examines the population demographics and extent of competing stores that also serve this population.
- **Analog Models:** Assessing new sites by identifying existing similar sites whose trade area attributes resemble the new location.
- **Gravity Models:** Mathematical analysis that determines how many consumers will tend to shop at one store over another based on geographic proximity of the various alternatives.
- **Game Theory Based Models:** These models take into account competition in a dynamic way.

Spatial Interaction Models

Lately, computer-aided techniques that combine aspects of all of the previous first four techniques have become available. Called spatial interaction models (SIMs), these techniques add consideration of the proclivities of the particular consumer market segments, or lifestyles, that might shop at the prospective location or its competitors.

SIMs combine consideration of the following variables:

- The spending tendencies and other attributes of individuals who live near, work near, or potentially visit a prospective location. Commercially-supplied data exist that categorize American households by census blocks or ZIP codes into 50 or so distinct demographic categories reflecting distinct lifestyles that can be correlated with traveling, shopping, and consumption preferences.
- The characteristics of the store and its contents, including its brand popularity, size, range of merchandise, neighbors, pricing policies, and parking.
- The likelihood of an individual shopping at a prospective location as influenced by the travel requirements in driving to get there. This is the gravity function or distance decay factor. Data exist that support calculations showing that the strength of gravity varies considerably, depending on the characteristics of the store and the attributes of the individual. The travel requirements can be measured in direct miles, road miles, or typical travel time. Distance decay is also influenced by the popularity of a store brand name and the amount of advertising conducted to raise awareness.
- The locations and characteristics of existing and prospective competition, which each have their own distinctive distance decay factors. A competitive store in relation to a prospective store can be said to cause a blocking of its gravity that would otherwise exist.

For a particular prospective store site, these four variables are all merged for each geographic subdivision, for example a census block group or ZIP code, from which customers originate. Through the solution of simultaneous equations, the SIM takes into account competition,

visibility and attractiveness of the store, natural and psychological barriers, road networks and drive times, resistance to travel, and demographic and expenditure factors of appropriate consumers. Weighted market shares are calculated for each block group, and the block groups collectively containing the customers are considered to be the market-share weighted trade area (Hooper 1997)

The SIM can be calibrated against reality by applying it to geographic areas that include existing stores for whom customer data is available. Actual customers in known home locations that each have particular lifestyle attributes (independently measured) provide the empirical data needed to calculate the appeal and distance decay of the existing store and its competitors.

For companies that want to avoid spending money on analytical techniques, a popular site selection methodology is to locate close to other store locations that have benefited from the application of these techniques, or that otherwise are experiencing high volumes of customer visits. For example, a donut shop planner may reasonably decide that their best new locations are as close as possible to the stores of a leading hamburger franchise that do not already have a competing donut shop nearby. Or, the best locations for a new donut chain with lower prices and a wider selection may be those that are in fact close by the existing donut competition. Mark Zygmontowicz, a principal at the retail consultancy Thompson Associates, notes "If you offer better service, prices, or merchandise, it may be helpful to have your biggest competitor across the street." (Gentry 1998)

Site selection models are oriented to the dominant modes of travel for the geographic area being examined. The market share of walking from home and transit from home in most location is so small as not to be noticeable within the ranges of accuracy of analytical models.

TRAVEL DEMAND MODELING -- PARALLELS AND DIFFERENCES WITH RETAIL MODELING

MPO transportation planners use mathematical models called four-step synthetic travel demand models for simulating and forecasting traffic flows across a metropolitan areas. These are clearly a form of spatial interaction model (SIM), although this terminology is not used by transportation planners. These models typically have four independent steps carried out in the sequence indicated (Blain and Charnews, 1998; Harvey and Deakin, 1993):

- Estimated generation of trips across zones of origin (productions) and destination zones (attractions). Zones are measured by their population, housing, and employment by sector.
- Distribution of trips across origin-destination pairs of zones according to a gravity model.
- Determination of mode choice for the trips: drive alone, carpool, or transit based on where transit goes and current transit use.
- Assignment of trips to the road network, which is measured by lane capacity and speed limit.

MPO planners typically calibrate their metro-wide transportation models against a recent past baseline date for which demographic, economic census, and traffic and transit counts are available. Then, after calibration, the model is run with land use assumptions and demographic forecasts for a date twenty to thirty years in the future. Multiple runs are made for this future projection against different policy assumptions. The differences in resulting traffic flows and congestion levels between the different policy assumptions are typically under five percent. For example, a model of year 2015 vehicle trips in greater Los Angeles published by the Southern California Association of Governments shows 1.9 percent difference between the "no policy change" scenario and a scenario of multiple policies (Southern California Association of Governments, 1996). This *20 year change* of 1.9 percent is small, one might say insignificant, compared to an *annual* growth in number of trips of 1.4 percent.

There are many interesting points of comparison between spatial interaction models for retail site selection (retail SIMs) and for metropolitan transportation planning (transportation SIMs).

- Retail SIMS are closely focused on travel for a single purpose of consumers taking a shopping trip. Transportation SIMS include all trip types, although journey-to work trips (commuting) are handled with the most care. Retail shopping trips are in a separate category, or in the larger category of "home-based to other." Calibration of the model against reality is made across the aggregate of all trip types.
- Retail SIMs are focused on measuring flows into one or no more than a few particular pinpoint retail destinations that are structured as a series of alternatives. Transportation SIMs are focused on measuring flows between origins and destinations throughout a geographic area, typically a metropolitan area.
- Retail SIMS are based on existing small area residential origins and existing or prospective retail destinations. Transportation SIMS are based on existing and prospective small area residential origins and small area retail commercial destinations.
- Retail SIMS are aimed at varying the location of the prospective destination(s) until the resulting traffic yields a desired revenue stream from all possible trip origins. Transportation SIMS are aimed at determining gravity relationships that allow calibration to real traffic flows in the present.
- Retail SIMS are aimed at modeling the near term future, typically a near-term future year. Transportation SIMS are aimed at modeling traffic flows 20 to 30 years hence based on gravity relationships calibrated to the present and on projections of trip production and attractions based on forecasted demographic and land use changes.
- Retail SIMs calculate trip productions and attractions in a single step. Transportation SIMs calculate productions and attractions independently, and balance them with a mathematical adjustment.

- Retail SIMS compute trip generations and trip distributions simultaneously, since the trip destination is singular. Transportation SIMS compute trip generation and trip distributions as two sequential steps, with gravity the main determination of trip distributions..
- Retail SIMS generally make no distinction about mode of travel, largely assuming travel by private vehicle. Transportation SIMS calculate shares of the transit and private vehicle modes.
- Retail SIMS contain an assumption about the standard drive time from each origin zone to each destination point. Transportation SIMS assign all vehicle trips to the road network in a way that can be calibrated to actual capacity and loading of the road network.
- Retail SIMS calibrate their gravity function against the observed behavior of customers in light of a variety of destination characteristics and a sophisticated measurement of customer lifestyle. Transportation SIMS calibrate an average gravity function for retail shopping trips against retail employment in the commercial destination zones and summary demographics in the household origin zones.

CRITIQUE OF PLANNING MODELS

Future land use changes are input assumptions to the transportation planning models. For example, planners in the central Puget Sound region assume that an increasing portion of new housing and employment will be concentrated in 21 designated urban centers as a result of regional growth management and transportation strategies. These are estimates by planners familiar with local development patterns and, at best, can provide rough estimates of, or perhaps goals for, the real transportation system performance of center-focused development as determined by market forces and government policies.

Assumptions about human activity patterns twenty or more years in the future are heroic at best. Planners thirty years ago did not foresee women joining the work force and the rise in the level of per capita vehicle ownership and use. Thus the limitations of four-step travel demand modeling in forecasting the long-range travel changes resulting from nonwork activities are significant (Horowitz, 1985; Moore and Thorsnes, 1994). Data needed to specify different gravitational factors, whether for consumer attributes like income that show people's orientation to certain stores, or for retail attributes that attract people - prices, quality, and variety of goods - are simply not used in these transportation models, unlike their use in retail site location models. Modeling studies of store location and consumer behavior dynamics have not yet migrated from the private sector store planning environment to the public sector land use and transportation environments.

Regional travel demand models have also not been designed to estimate the frequency at which two or more trips are combined in a tour. The models assume that each trip has a separate utility not related to other trips to which it may be linked.

Activity Models

Interestingly, the future of transportation modeling seems to be taking a different direction from the 4-step gravity-based models that store planners are refining and using successfully. The new wave for transportation planners are household-activity-based models which attempt to simulate decision making about who travels where, why, and when at the household level (USDOT 1995b). The household activity decision process is complicated, and applying these models in ways that depict behavior in the Internet-wired household 20-30 years in the future will be a very demanding exercise.

Activity models are also not focused on reading the entrepreneurial minds of commercial real estate developers and retail empire builders who are constantly on the lookout for new opportunities. The failures and successes in pursuing these business opportunities that will only be apparent ten years from now will in turn lead in further uncertain ways to a round of successes and failures twenty years from now. How retail looks twenty years from now also depends on the behavior of age cohorts, such as the Baby Boomers and Generation x, that is difficult to predict .

Simulation Models

Transportation simulation models like Transims (Casti 1997) are another coming line of development for transportation planners. This latest wave in transportation modeling relies on measuring travel behavior through household surveys and then synthesizing current metro traffic patterns by simulating the movement of every vehicle in every household. The fundamental limitations of understanding business behavior, consumer behavior, resulting land use, and resulting travel behavior 20 to 30 years hence is problematic. Simulation models on sufficiently powerful computers do offer the opportunity to test the effects of different assumptions about land use and travel behavior in future periods, but they do not suggest what assumption or range of assumptions are most likely.

CONCLUSIONS

The limited scope and short-run focus of retail SIMs contrasts starkly with the metropolitan-wide scope and long-run focus of transportation SIMs. Our conclusion is that metropolitan transportation modelers are overreaching when they try to simultaneously forecast changes in the land use and travel patterns in response to changes in the transportation environment multiple decades in the future.

Insights into consumer behavior developed by Hibshoosh and Nicosia (1987) provide some justification for our skepticism about the meaning of what transportation models say about the future 20 to 30 years hence. These researchers elaborate a theory, illustrated with many practical examples, that places the wide range of consumer activities -- including traveling to shop, shopping to decide what to buy, the purchasing of the goods, and using goods -- into a framework that recognizes the place of cultural values and institutional norms. Cultural values are widely held beliefs that affirm what is desirable and have an impact on consumer activities

(Nicosia and Mayer, 1976; cited by Hibshoosh and Nicosia).

Institutional norms are rules that guide specific activities toward consistency with the achievement of cultural values. In the Hibshoosh/Nicosia theory, among other roles in society, institutions translate cultural values into norms, maintain the norms, and govern performance of activities. The multiple institutions that bear on consumer behavior -- ranging from the various distinct segments of the retail industry itself to the different forms of media to family to the places of employment where people earn the money to shop -- all interact in very complex ways to create norms and resulting consumer activities that mesh together to create changes in travel behavior for shopping. The particular rearrangements of retail space and residential offerings and travel behavior that transportation modelers hold out as the quantification of the TOD year 2020 vision are inevitably made with but a trivial elaboration of the complex of cultural values and institutional norms that drive activity. Statements like "Baby Boomers will likely want to move back to the city when their kids are grown" or "workers will find it convenient to pick up their groceries on the way home from work" are the level of detail offered.

These prognostications are slim justification for major transportation investments when statements implying the exact opposite norms are equally reasonable based upon institutional context scenarios that are also reasonable. The particular results that are calculated in transport SIMs based on the particular arrangements of people and space come across in the light of the social context as very arbitrary.

Pervasive and ongoing complexity and uncertainty in the future organization of metropolitan space and human behavior within it is both the historical past and most likely future in the United States. In a mostly free, peacetime capitalist democracy with high levels of discretionary spending and investors constantly looking for ways to exploit technology for the satisfaction of consumer preference, the opportunities afforded by the market appear too unbounded and unpredictable to expect accurate predictions of the public transportation policy impacts on location and movement 20 to 30 years in the future. "Present levels of public expenditures on transportation are insignificant in comparison with the aggregate of private expenditures." (Harvey and Deakin, 1993, p. 5-10)

This reality of complexity and uncertainty implies the need for planning processes that generate a variety of potential future scenarios that could result from extensions of forces visible today. In particular, alternative scenarios for the cumulative effects of incremental technology improvements in the most pervasive systems of the present era -- individual automobility and communications -- need to be more fully drawn out. Modeling, if applied with care, can support scenario analysis (van der Heijden 1996). "Scenario testing approaches suggest an alternate use of modeling as a means of exploring policy implications." (Harvey and Deakin, 1993, p. 5-9) Further, policies that motivate improvements that can be built modestly, incrementally, and flexibly would seem a better response to complexity and uncertainty than proposing expensive, big leaps and hoping for a sea change that will make the investment in a big leap pay off.

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