

# Shopping Travel Behaviors in an Era of Rapid Economic Transition

## Evidence from Newly Built Malls in Prague, Czech Republic

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The rapid transformation in both the location and type of retail provision in the Prague metropolitan area, Czech Republic, between 1997 and 2001 offers a unique opportunity for examining the relationship between land use and shopping travel behavior. The case of Prague is unique. Although the Czech capital has the compact form and transit-rich environment sought by many planners, after rates of motorization rose steadily in the early 1990s foreign developers began constructing shopping malls on the city's fringe in 1997. Although retail provision was being remade on highway-adjacent locations outside the traditional central business district, there were few changes in Prague residential and employment locations. Thus, the shift in shopping land use occurred in relative isolation. Shopping travel behavior before and after the introduction of the fringe shopping malls is examined by using research based on 1,649 surveys collected in four new malls in 2001. Mall visitors reported current demographic information and mall travel behavior as well as their travel habits for the same trip purposes before the introduction of the surveyed mall. The before-and-after data demonstrate how shopping travel behavior has changed with the changing retail land uses. Specifically, shifts in three travel behavior variables (trip frequency, shopping duration, and mode split) disaggregated by key demographic characteristics (age, gender, income, car ownership, and household size), are analyzed. Several striking shifts are apparent: people shop less often and for longer periods of time and are less likely to walk to shopping locations.

The role of land use patterns in affecting travel behavior is a topic of keen concern among transportation planners. There has been much interest in North America in the possibility of a return to dense, mixed-use land patterns more characteristic of traditional urban form as a means to reduce the demand for travel. At the same time, many developing nations that are characterized by these traditional mixed-use land patterns are taking incipient steps toward the type of sprawling development typical of North America. The transition period, which occurs as developing nations straddle both existing, traditional urban forms and nascent, auto-oriented growth, provides a unique window to examine the connection between land use and travel behavior.

Central and eastern Europe provide a particularly pertinent location for study. In these areas, a half-century of socialist, centralized

planning resulted in a high-density urban form that is well served by an expansive and inexpensive transit network. The decade of economic transition following the lifting of the Iron Curtain has resulted in rapidly rising motorization rates. To date, there has been limited change in spatial organization of the residential and employment sectors in most cities in the region. Instead, the retail sector, which was largely neglected during the Communist period and is currently being financed and developed by foreign entrepreneurs, is leading land use changes in many central and eastern European cities.

Concern that the rapid construction of North American-style shopping centers is the harbinger of community-wide sprawl has led to research, initiated by the Institute for Transportation and Development Policy, to assess the changing travel behaviors witnessed among shopping center patrons regarding their mall purpose trips. This paper uses the term "mall purpose" to refer to the primary purpose for which the trip to the retail center was made. Because malls offer a range of activities, identifying the primary purpose is essential for comparison to equivalent previous travel behaviors. The associated travel behaviors studied include trip frequency, activity duration, and mode choice. Each of the travel behaviors is examined in relation to several demographic characteristics thought to affect travel to malls. These characteristics include age, gender, income, car ownership, and household size.

The information used here was gathered through surveys conducted at four recently constructed malls on the fringes of Prague, Czech Republic. Prague was chosen as the study location because the city has traditionally been at the vanguard of development in Central and Eastern Europe. By examining the current trends in Prague, this research aims to improve subsequent planning throughout the region.

The paper is divided into five parts. The first section provides a literature review of changing shopping behaviors. The second section describes recent developments in the city of Prague. The third section describes the survey methodology and the malls where surveys were conducted. The fourth section analyzes the survey results, and the fifth section offers concluding thoughts.

### LITERATURE REVIEW

Nonwork travel, particularly shopping travel, has received increasing attention from researchers worldwide. National travel habit surveys show that shopping trips account for roughly a fifth of all trips in the United States and the United Kingdom. This share is slightly larger than that of work commuting (1–3). However, shopping is distinct from commuting travel, in which trip frequency, destination location, and arrival and departure times are relatively fixed. Shoppers,

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in theory, can vary their trip frequency, choose from a broad array of location options, and enjoy more flexibility regarding departure and arrival times. As such, shopping travel is thought to be more responsive to changes in urban policies, particularly land use.

The major land use change that has affected shopping provision in the post-war era has been the introduction of the shopping center. A widely accepted definition of shopping centers among transportation researchers and planners is that of the Institute of Transportation Engineers Trip Generation Manual: "A shopping center is an integrated group of commercial establishments that is planned, developed, owned and managed as a unit. . . . A shopping center also provides on-site parking facilities sufficient to serve its own parking demands" (4). (In this paper, the terms "shopping center" and "mall" are used interchangeably.)

The narrow focus of this work on travel changes in response to mall development is unique and reflects the unusually brisk pace of mall development over a specific time period (1997–2001) in Prague. Although this condition presents exciting research possibilities, there are few comparative precedents within the literature.

Most studies on changing shopping behaviors compare patterns between two surveys of metropolitan travel habits. Unfortunately, the lengthy time lag of up to 2 decades that is typical between metropolitan surveys limits their ability to isolate certain types of changes. Over such long time spans, residential and employment land use patterns, not just retail uses, have ample time to adjust to new transportation options. Similarly, travel behaviors are more likely to be affected by social changes, such as workforce participation rates. As a result, the travel patterns explored in long-term comparisons reflect a broad range of interacting adaptations.

Two such studies compare pairs of metropolitan travel habit surveys undertaken 20 years apart. Kim et al. (5) examined shopping travel changes between 1970 and 1990 in DuPage County, a rapidly expanding suburban area outside Chicago, Illinois, and Levinson and Kumar (6) examined shopping travel changes between 1968 and 1987/1988 throughout the Washington, D.C., metropolitan region. Despite the general similarity of the study designs and time frames, the researchers found distinct trends. Per capita shopping frequency declined substantially in DuPage County, whereas it increased slightly in Washington. The duration of each shopping trip was reduced 14% in DuPage County, whereas it rose 2% in Washington.

For both cities, the authors attribute much of the changing travel habits to female participation in the work force. Such participation reduces time available for other purposes and encourages increased efficiency in scheduling trips. However, the increased household income is thought to encourage consumption and, thus, shopping. The researchers emphasize the trend toward imbedding shopping trips within trip chains, particularly during the afternoon peak periods (5, 6).

The authors of the DuPage County study add that in trip chains less time is spent at each stop. They argue that attempts to improve the overall efficiency of travel patterns "make shopping a more directed activity" and thus reduce shopping duration (5).

The authors of the Washington study argue that shopping habits vary widely between employed workers and nonworkers, with nonworkers making more and longer shopping trips. As women enter the workforce, there are fewer nonworkers to carry the shopping burden. As a result, working men and women both increase the frequency and duration of their shopping trips. This increase is largely offset by the reduction in shopping by nonworking people (6). Thus, in Washington, the aggregated increase in shopping duration per trip was minimal.

These explanations may link what seem like inconsistent findings. As a suburban area, DuPage County may have had larger initial levels both of income and the rate of female nonparticipation in the workforce. Both factors are thought to encourage higher shopping frequencies and durations. As a result, the increase in women's workforce participation may have resulted in net reductions in both per capita frequency and shopping duration.

Although the expansion of suburban shopping centers was noted as an influencing factor in both studies, the long time frames used limited the ability to assess the effects of this land use change more directly. Conversely, one study of changing shopping patterns based on the introduction of an infill mall in Haifa, Israel, used a short time frame but addressed a situation in which malls were already dominant. Nonetheless, the introduction of the new mall largely drew customers from malls on the urban fringe. These customers traveled shorter distances and shifted travel mode away from private vehicles to some degree (7).

A study from Turku, Finland, uses a short time period to examine changes in travel behaviors in response to the introduction of fringe shopping center options (8). There, the first fringe shopping center began incremental development in 1989. Metropolitan shopping travel habit surveys were conducted in both 1990 and 1992 to track changes in response to the growth of the peripheral retail options, as opposed to the city center. Between the two years of the surveys, the share of Turku respondents that used a car always or often for shopping trips increased 15% to reach a 52% mode share. These shares were affected by demographic variables. Larger household sizes, higher household incomes, and younger age groups chose private vehicles more often. Gender appeared not to affect private vehicle choice. Mode choice varied between shopping venues. In 1992, 77% of trips to the new mall option were by car, whereas only 35% of trips to city center shopping and 19% of local, neighborhood shopping trips were made by car. Transit garnered the highest single share (43%) of shopping trips to the city center, whereas walking was the primary mode of choice (78%) at local stores (8).

Despite a dearth of longitudinal studies, it is possible to consider shopping travel behaviors, particularly regarding mode shares, from research efforts examining land use characteristics. Several studies have shown a high rate of pedestrian mode choice for shopping in traditional neighborhoods (9–11). By contrast, the private vehicle is overwhelmingly preferred for travel to suburban shopping malls (4, 12). Transit seems to serve neither local shopping (11) nor fringe shopping (7) particularly well. This mode appears to be best suited for city center shopping trips (13).

These land use studies suggest that as new shopping malls develop on the periphery of Prague, there will likely be a mode shift from pedestrian transport to private vehicle use.

## PRAGUE

Prague is the capital of the Czech Republic. The city is home to 1.2 million inhabitants and covers 496 km<sup>2</sup>. It has a dense core of prewar historical districts surrounded by a ring of newer districts built mostly during the socialist regime. These new districts were designed as medium- and high-density bedroom communities for the working population.

Prague maintains an extensive, well-integrated public transportation network totaling 857 km and comprised of subway, tram, funicular, and bus lines. This network is complemented by regional rail and bus services. In 2001, Prague reported a 57% public transport mode share of weekday passenger trips (14).

Despite the ample provision of public transport, Prague has always had one of the highest motorization rates of the eastern European cities. Nonetheless, this rate and the number of vehicle kilometers driven increased rapidly in the early years after the 1989 Velvet Revolution. Between 1990 and 1996, the number of privately owned cars per thousand people jumped 77% from 276 to 489. Between 1996 and 2001 the growth in the motorization rate became more level and rose only 10% to 537 personal cars per thousand people. These trends are reflected in the growth in vehicle kilometers, which leapt 112% between 1990 and 1996 and grew at a more moderate 25% between 1996 and 2001. In 2001 Prague reported a 43% private vehicle mode share of weekday passenger trips (14).

During the socialist era shopping options within Prague were quite limited. Large housing estates were often built without provision of retail outlets (15). The collapse of the socialist system resulted in the development of new retail markets. Foreign investors began developing malls at a rapid pace in the second half of the 1990s, with the first mall opening in 1997. Since then, these centers have become a dominant form of retailing. This first wave of new malls, which is the focus of this research, has been characterized by construction at the city periphery, with a heavy emphasis on retailing as opposed to entertainment and other offerings.

## METHODOLOGY

In fall 2001, a survey of patrons at four of Prague's most prominent newly built malls was conducted to assess changes in travel patterns. This section presents the shopping malls where surveying took place,

the methodology of that survey process, and a sample of the survey responses.

## Characteristics of Shopping Centers

The four shopping centers chosen for this survey are located at each of the four compass points on the Prague perimeter, as shown in Figure 1. All of the malls are located at or near the intersection of a radial highway with the ring road that is being constructed in sections around the city. Two malls (East and West) are located at the ends of a subway line, and one mall (North) is well served by the bus system. The South mall has limited bus service.

The four centers are built on a similar, but not identical, model. The anchor store for each center is a "hypermarket." Hypermarkets are a type of store pioneered in western Europe; it combines a supermarket with a discount retailer. For a store to qualify as a hypermarket, more than half of the merchandise for sale must be nonfood items. The popularity of hypermarket shopping among Prague residents has risen dramatically over the past several years (16).

The major differences among the malls result from the other shops in the center and the way those shops are integrated. Two centers (North and East) have traditional mall designs in which the hypermarket is linked by a covered, climate-controlled gallery to a series of small specialty shops. One center (West) combines big box retailers with a plaza design in which a series of large retailers are contiguously placed between two major anchors with no common climate-controlled space. Customers must go outside to pass between stores. The last center (South) employs a standard big box design in which

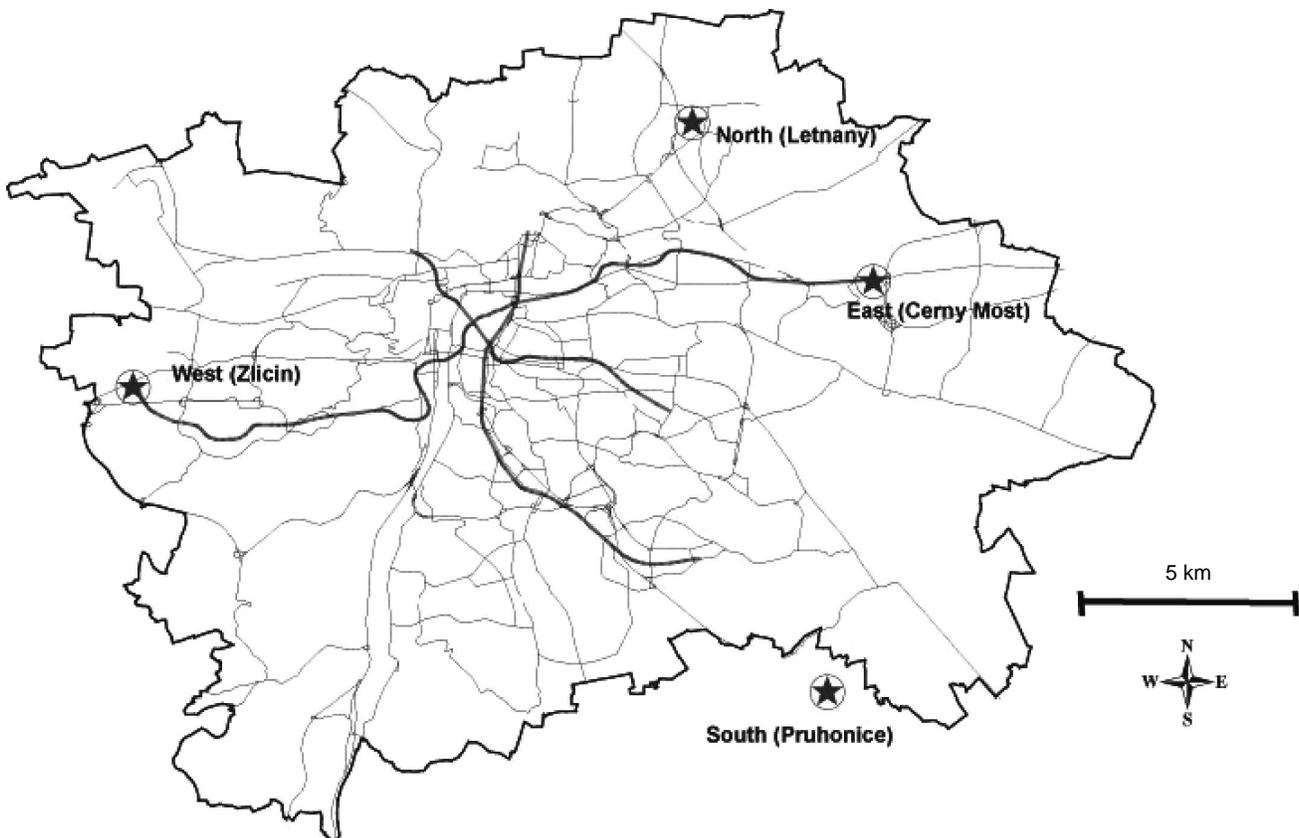


FIGURE 1 Map of Prague malls.

major retailers are located nearby, but in separate buildings, each with its own parking lot and management. This center is unusual in that one of the three boxes is actually a small mall made up entirely of specialty retailers without any major anchor. Table 1 presents the major characteristics of the malls.

## Survey

The surveys included questions regarding three major topics: demographic characteristics, current travel behavior, and previous travel behavior.

Demographic information requested included age, gender, household income, household car ownership, and household size. Current travel behavior information requested included preactivity purpose, postactivity purpose, frequency of visits, duration of mall activity, mode choice, and primary and secondary purpose for the trip to the mall. Primary and secondary purposes of the trip included grocery shopping, other shopping, entertainment–sports, dining, and work. Shopping trips could involve more than one purpose, and respondents were therefore asked to identify which purposes were primary and which were secondary. Information requested on previous travel was limited to frequency of visit, duration of activity, and mode choice.

The challenge of the research was to connect previous and current travel behaviors as accurately as possible, given the constraints of a single survey, in order to assess the changes in travel behavior occasioned by the advent of the new malls over the previous 4 years. It was assumed that mall-equivalent purpose behavior is sufficiently habitual such that respondents could recall with relative accuracy the answers to questions asked about their previous patterns.

To compare the previous and current behaviors, respondents were asked their primary purpose for making the current trip to the mall as well as their trip-making frequency, activity duration, and mode choice for that purpose. They were then asked to define where they would have gone before the existence of the current mall to fulfill that same purpose. The subsequent questions over trip frequency, activity duration, and mode then referred to their travel habits regarding that previous location.

The surveys were conducted in October and November 2001. The dates were thought to fall between “back to school” and Christmas

peak shopping seasons. Each mall was surveyed between 4 and 7 p.m. on a Thursday and between 11 a.m. and 2 p.m. on the following Saturday. These hours were identified as peak weekday and weekend shopping periods, based on previously obtained central and eastern European mall traffic counts (Dybicz, T., G. L. Newmark, and Y. Garb. *Traffic Generation Characteristics of Shopping Malls in Central Europe*. 2002).

Surveyors were told to circulate throughout the public areas in the shopping centers and to approach individuals or groups to request their participation in the survey. When encountering groups, the survey was directed to the member who responded to the request for surveys.

The dates of the surveys, as well as the number of respondents at each mall, are shown in Table 1.

## Survey Sample

In total 1,649 responses were collected, with roughly the same number of surveys collected at each of the shopping centers surveyed. A slightly larger number of surveys was collected at the compact North mall, and a slightly smaller number of surveys was collected at the more dispersed South mall. The number of responses on Thursday was slightly less than that recorded on Saturday. This variation was likely due to a greater willingness of people to participate in surveys on the weekend than midweek when there are more external time constraints.

The survey sample includes a smaller proportion of males (46%) than females (54%). Three-quarters of the sample reported average household incomes, with the remainder fairly evenly split between the categories of below average and above average. There were significant statistical differences in income breakdown reported between the North and South malls. The North mall represents a less affluent sample and the South mall a more affluent one.

The bulk of respondents (87%) came to the mall primarily for shopping purposes. About two-thirds of these shopping trips were for groceries, and one third for other purchases. Of the total sample, about 7% came primarily for entertainment–sports, and 4% came for work. This breakdown reflects the fact that these early central European malls were built primarily as retail venues. The newer malls,

TABLE 1 Shopping Center Characteristics and Survey Information

General Information							Survey Information			
Compass Point (Area)	Shopping Centers Surveyed	Date Opened	Center Style	Gross Leasable Area, GLA (m <sup>2</sup> )	Hypermarket Percentage of GLA	Transit Access	Thursday	Surveys	Saturday	Surveys
North (Letnany)	Letnany	Nov 1999	Mall	15,000	80%	Good	25 Oct 2001	217	27 Oct 2001	251
	Hypernova	April 1998	Box	16,200	60%	Poor	8 Nov 2001	38	10 Nov 2001	45
South (Pruhonice)	Makro	na	Box	na	95%	Poor	8 Nov 2001	106	10 Nov 2001	122
	Spektrum	April 1998	Mall	6,500	0%	Poor	8 Nov 2001	24	10 Nov 2001	22
East (Cerny Most)	Centrum Cerny Most	Nov 1997	Mall	25,000	38%	Good	4 Oct 2001	208	6 Oct 2001	193
West (Zlicin)	Shopping Park Praha	Nov 1998	Plaza	47,400	33%	Good	18 Oct 2001	189	20 Oct 2001	234

built since the survey, reflect the evolution of malls elsewhere in incorporating a greater mix of entertainment and dining options.

Trip chaining is a variable frequently considered in analyses of both mall trip generation and nonwork travel. On the basis of data from the entire sample, only about 15% of trips to these malls were linked trips, with the remainder being primary trips. The primary trips were almost exclusively (96%) trips that started and ended at home locations. The sample collected on Thursday reported a higher percentage of linked trips (21%) than that of the entire sample. Not surprisingly, on Thursday afternoons, roughly half of the linked trips were trips that originated at work and ended at home locations.

In all, almost 68% of respondents traveled by private car, including the car drivers (44%), passengers (23%), and drop-offs (0.5%). Only 14% of private vehicles had only one shopper; the remaining vehicles carried parties of two or more. Other respondents came to the shopping centers by buses, metro, tram, bicycles, taxis, and walking.

**FINDINGS**

The survey results show a distinct pattern of change in travel behaviors. In general, with the provision of new fringe shopping centers in Prague, patrons make fewer, longer trips and tend to shift travel mode from pedestrian to vehicle, particularly the private vehicle.

**Trip Frequency**

The frequency of patrons’ mall purpose trips, as shown in Figure 2 and Tables 2 and 3, decreased with the opening of the new mall. Survey respondents reported a drop from 47% to 20% in the share of patrons who make more than four trips per month. There was a cor-

responding increase from 26% to 54% in the share of patrons who make two or fewer trips per month, and the share of shoppers who make three or four trips per month remained roughly constant.

This reduction in trip frequency should be considered with some caution because it is likely that even after the addition of the malls, some shopping trips are still made to local nonmall retail areas. These trips were not captured in the scope of this survey.

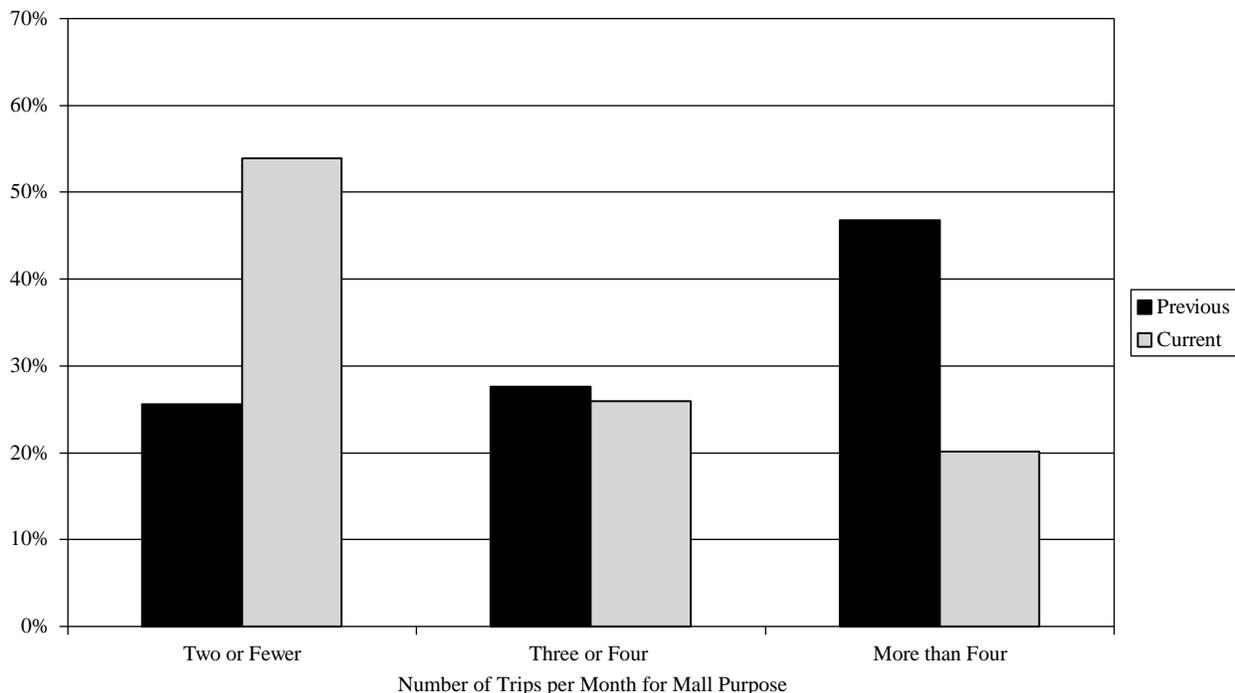
*Age*

Age appears to be an important part of why there is no overall change in the three or four trips per month share. Whereas all age groups decreased their share of more than four trips a month and increased their share of two or fewer trips a month, the age groups under 40 decreased the likelihood of three or four times a month shopping while the age groups 40 and older increased it.

*Gender*

Men and women reported shopping frequencies surprisingly similar to each other both before and after the introduction of the malls. The largest gender variation reported for any single shopping frequency was 15%.

The introduction of the malls did produce a slight gendered shift in shopping travel frequencies, with women disproportionately changing to become less frequent shoppers. Initially women reported a share of more than four trips a month 11% higher than men and a share of two or fewer trips a month 2% lower than men. After the introduction of the malls, women reported a share of more than four trips a month 6% lower and a share of two or fewer trips a month 11% higher than men.



**FIGURE 2** Frequency of shopping trips per month.

TABLE 2 Frequency of Mall Purpose Trips per month by Demographic Characteristics

Characteristic	Category	Two or Fewer		Three or Four		More than Four		Number	
		Previous	Current	Previous	Current	Previous	Current	Previous	Current
Age	70+	24.5%	56.3%	18.1%	22.9%	57.4%	20.8%	94	96
	60-69	17.2%	44.3%	32.8%	34.8%	50.0%	20.9%	116	115
	50-59	23.8%	46.5%	26.8%	30.7%	49.4%	22.8%	239	241
	40-49	24.5%	53.5%	23.7%	24.2%	51.8%	22.3%	257	273
	30-39	24.6%	54.8%	29.0%	27.8%	46.3%	17.4%	341	345
	20-29	29.6%	61.3%	29.3%	23.0%	41.1%	15.7%	406	426
	Under 20	29.5%	49.3%	29.5%	20.8%	41.0%	29.9%	139	144
Gender	Male	25.9%	50.7%	30.0%	28.4%	44.1%	20.9%	721	747
	Female	25.5%	56.4%	25.5%	24.0%	49.0%	19.6%	862	883
Income	Below	21.0%	55.5%	24.3%	17.4%	54.8%	27.1%	210	218
	Average	26.4%	55.2%	27.0%	26.5%	46.6%	18.3%	1172	1203
	Above	24.5%	43.2%	33.7%	32.8%	41.8%	24.0%	184	192
Car Ownership	No Cars	22.2%	54.7%	22.2%	22.5%	55.6%	22.8%	261	267
	One Car	27.0%	55.5%	28.1%	26.2%	45.0%	18.3%	916	941
	Two Cars	26.7%	49.4%	28.7%	29.0%	44.6%	21.7%	303	314
	More than Two Cars	23.1%	52.4%	33.3%	23.2%	43.6%	24.4%	78	82
Household Size	One Person	19.0%	58.1%	30.8%	26.1%	50.2%	15.8%	315	322
	Two Persons	27.3%	57.8%	28.9%	26.4%	43.8%	15.8%	395	405
	Three Persons	25.9%	50.8%	26.5%	27.4%	47.6%	21.8%	464	478
	Four Persons	30.4%	52.6%	24.1%	22.9%	45.6%	24.5%	237	249
	More than Four Persons	32.9%	46.0%	22.0%	27.6%	45.1%	26.4%	82	87

TABLE 3 Trip Frequency, Activity Duration, and Mode Choice by Shopping Center

Behavior	Categories	West (Zlicin)		East (Cerny Most)		North (Letnany)		South (Pruhonice)	
		Previous	Current	Previous	Current	Previous	Current	Previous	Current
Visits per Month	Two or fewer	39.40%	73.40%	25.20%	42.30%	19.10%	43.50%	18.80%	57.60%
	Three or four	20.20%	15.00%	24.50%	28.10%	32.40%	30.20%	33.00%	31.20%
	More than four	40.40%	11.60%	50.30%	29.80%	48.40%	26.20%	48.00%	11.30%
	n	401	421	384	400	462	466	345	353
Duration of Visit	0 to 1 Hour	56.9%	27.3%	58.8%	43.6%	72.2%	51.2%	70.7%	38.6%
	1 to 1.5 Hours	19.8%	18.3%	16.6%	24.6%	16.6%	24.6%	20.0%	24.2%
	1.5 to 2 Hours	12.4%	25.2%	9.5%	11.8%	6.0%	12.2%	5.1%	17.2%
	More than 2 Hours	10.9%	29.2%	15.0%	20.1%	5.3%	12.0%	4.2%	20.0%
	n	394	421	379	399	453	467	335	355
Arrival Mode	Private	39.3%	63.6%	44.2%	65.8%	40.1%	57.1%	59.6%	89.4%
	Public	27.8%	35.7%	21.8%	25.2%	16.6%	37.8%	7.3%	10.1%
	Pedestrian	27.6%	0.7%	33.2%	9.0%	40.1%	5.1%	27.4%	0.6%
	n	399	423	385	401	464	468	354	357

*Income*

Several small changes in the relation between travel frequency and income took place with the introduction of the malls. The below-average income group changed from having the lowest two or fewer trips share (21%) to the highest two or fewer trips share (56%). The average income group saw the steepest drop in the more than four trips frequency share, from 47% to 18%. The above-average group saw the smallest changes in the most or the least frequent share. Both before and after the introduction of the malls, a third of these affluent patrons reported shopping three or four times a month.

*Car Ownership*

In considering the 95% of the survey population who owns two cars or fewer, there appears to be an inverse relationship between the number of cars in the household and the increase in the lowest trip frequency share. The increase in the numbers of those making two or fewer trips a month was 147%, 106%, and 85% for the no cars, one car, and two cars groups, respectively.

*Household Size*

Household size appears to be inversely related to changes in shopping trip frequency related to the introduction of malls. For households sizes of one, two, three, four, and more than four persons, the shares of two or fewer trips per month increased by 206%, 112%, 96%, 73%, and 40%, respectively. For the same groups the members who made “more than four” trips per month decreased by 69%, 64%, 54%, 46% and 42%, respectively.

**Shopping Activity Duration**

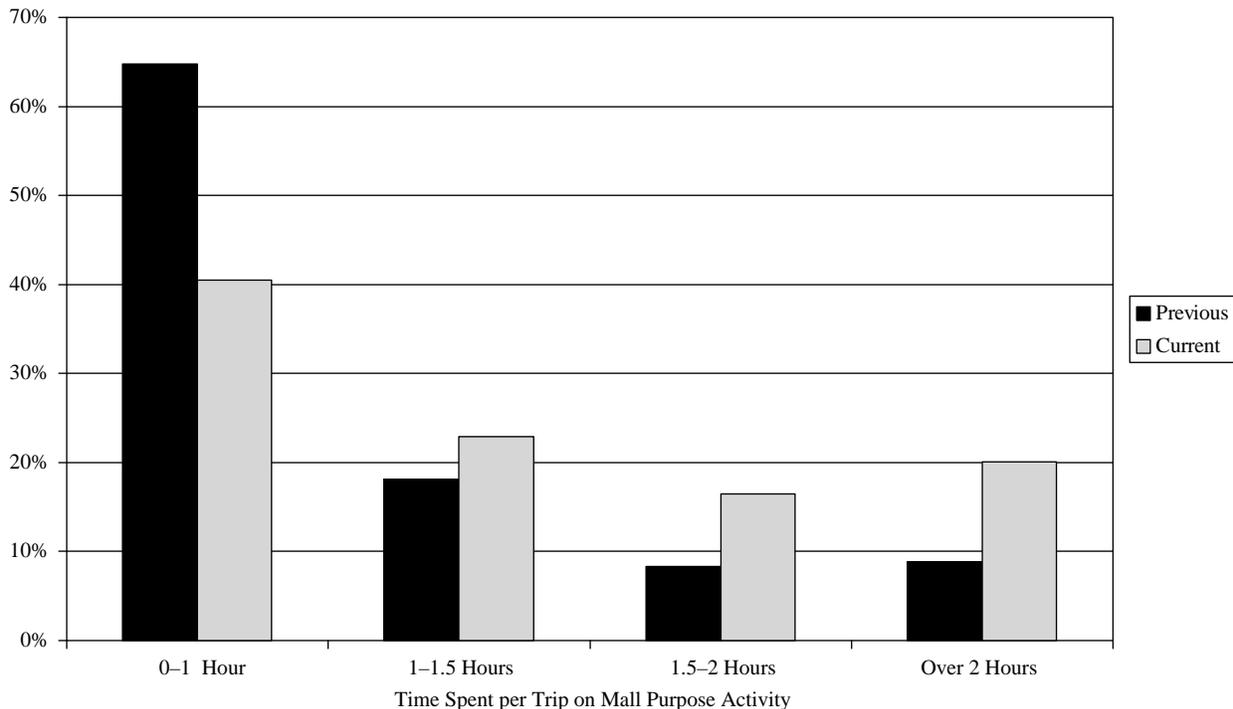
Although fewer shopping trips were made after the introduction of the malls, the time spent shopping per trip has increased. Figure 3 and Tables 3 and 4 illustrate the declining shares of activities with shorter durations and the rising shares of those with longer durations. The majority (60%) of patrons reported spending over an hour at the mall, whereas only 35% of patrons had previously spent more than an hour at the comparable activity location before the malls were opened.

*Age*

People in their 20s and 30s reported the largest shifts toward activities with longer durations. These groups reported the greatest decline in the under 1 hour activity share, which dropped 40% and 44%, respectively, and the largest increase in the over 2 hour activity share, which rose 182% and 186%, respectively. By contrast, the under 1 hour share declined the least, only 24% and 31% respectively for the youngest (under 20) and oldest (70 and over) age groups.

*Gender*

The introduction of the malls has seen increased differences between the durations of activities of men and women. The average percentage difference between men and women shopping duration shares rose from 8% to 32%. This disparity accentuated the trend toward longer durations of shopping activity among women, which existed even before the malls opened. The 1-h share dropped 47% for women, but only 27% for men. The more than 2-h share increased 151% for women and 95% for men.



**FIGURE 3** Duration of mall activity.

TABLE 4 Duration of Shopping Activity by Demographic Characteristics

Characteristic	Category	0 to 1 Hour		1 to 1.5 Hours		1.5 to 2 Hours		More than 2 Hours		Number	
		Previous	Current	Previous	Current	Previous	Current	Previous	Current	Previous	Current
Age	70+	66.7%	46.3%	17.2%	23.2%	9.7%	14.7%	6.5%	15.8%	93	95
	60-69	76.5%	49.1%	13.0%	23.3%	3.5%	12.1%	7.0%	15.5%	115	116
	50-59	66.7%	41.6%	17.9%	25.1%	6.4%	16.5%	9.0%	16.9%	234	243
	40-49	69.1%	44.5%	16.0%	22.8%	6.3%	14.7%	8.6%	18.0%	256	272
	30-39	60.7%	34.1%	21.8%	24.6%	10.0%	19.7%	7.6%	21.7%	331	346
	20-29	62.4%	37.6%	19.3%	20.9%	9.4%	16.4%	8.9%	25.1%	394	426
	Under 20	58.7%	44.4%	15.2%	20.8%	10.9%	17.4%	15.2%	17.4%	138	144
Gender	Male	66.6%	48.5%	17.0%	21.6%	8.1%	13.5%	8.4%	16.4%	706	746
	Female	63.1%	33.4%	19.1%	24.3%	8.4%	19.1%	9.3%	23.3%	846	886
Income	Below	64.1%	42.2%	16.0%	23.9%	7.8%	13.3%	12.1%	20.6%	206	218
	Average	67.0%	39.4%	16.9%	23.6%	8.2%	17.7%	7.9%	19.3%	1150	1203
	Above	53.1%	43.0%	25.7%	19.2%	10.1%	13.0%	11.2%	24.9%	179	193
Car Ownership	No Cars	72.3%	39.0%	11.1%	24.2%	8.3%	19.0%	8.3%	17.8%	253	269
	One Car	65.7%	40.2%	18.7%	23.7%	7.4%	15.9%	8.2%	20.2%	904	940
	Two Cars	59.3%	39.9%	20.9%	21.2%	8.4%	16.8%	11.4%	22.2%	297	316
	More than Two Cars	51.3%	48.1%	23.7%	16.0%	15.8%	16.0%	9.2%	19.8%	76	81
Household Size	One Person	70.1%	44.9%	15.1%	19.5%	6.6%	16.7%	8.2%	18.9%	304	323
	Two Persons	62.9%	36.9%	19.8%	27.1%	7.0%	17.0%	10.3%	19.0%	388	406
	Three Persons	63.0%	36.2%	18.7%	24.1%	9.6%	18.8%	8.7%	20.9%	459	478
	Four Persons	60.7%	43.8%	19.2%	18.1%	10.3%	12.9%	9.8%	25.3%	234	249
	More than Four Persons	62.5%	43.0%	22.5%	25.5%	11.2%	15.1%	3.7%	16.3%	80	86

### Income

Income differences were reflected in changes in activity duration before and after the introduction of the malls. The average income group reports both the largest reduction (41%) in the activity duration of under an hour and the largest increase (144%) in the activity duration of more than 2 h.

### Car Ownership

The decline in the activity share of under an hour was inversely related to the number of vehicles in the household. Households with zero, one, two, and more than two cars, respectively, saw their under-an-hour share decline 46%, 39%, 33%, and 6%. The growth in the longer activity shares was also generally inversely related to the number of cars in the household.

### Household Size

Household size appears not to have a significant affect on shopping activity duration.

### Mode Share

The mode split of current patrons, shown in Figure 4 and Tables 3 and 5, shows a shift from pedestrian to vehicle modes. The change is most glaring in the pedestrian mode split, which declined by from

33% to 4% among mall patrons. The former pedestrians have moved to vehicles and (disproportionately so) to private vehicles.

### Age

Although the pedestrian mode shares all decreased by between 83% and 95% for each age group, the growth in other modal shares varied considerably.

Those in the oldest and the youngest age groups saw larger increases (59% to 112%) in their transit mode shares. By contrast, age groups between 20 and 50 saw smaller increases (14% to 26%). The members of these middle-age groups seem to have substituted private vehicle for pedestrian trips at a higher rate.

Before the introduction of the new malls, for every cohort other than the 30-to-39 age group the majority of mall equivalent trips were made by nonautomobile means. By contrast, at the new malls and for every cohort other than the oldest and the youngest, the majority of trips were made by private vehicles. Four-fifths of youths younger than 20 who arrived by private car were passengers of other drivers.

### Gender

The differences between the mode shares of males and females appear to be similar before and after the introduction of the malls. Women continued to drive less and use public transit or walked more than men. However, the percentage difference in the private vehicle shares was narrower after opening the malls. Women experienced a

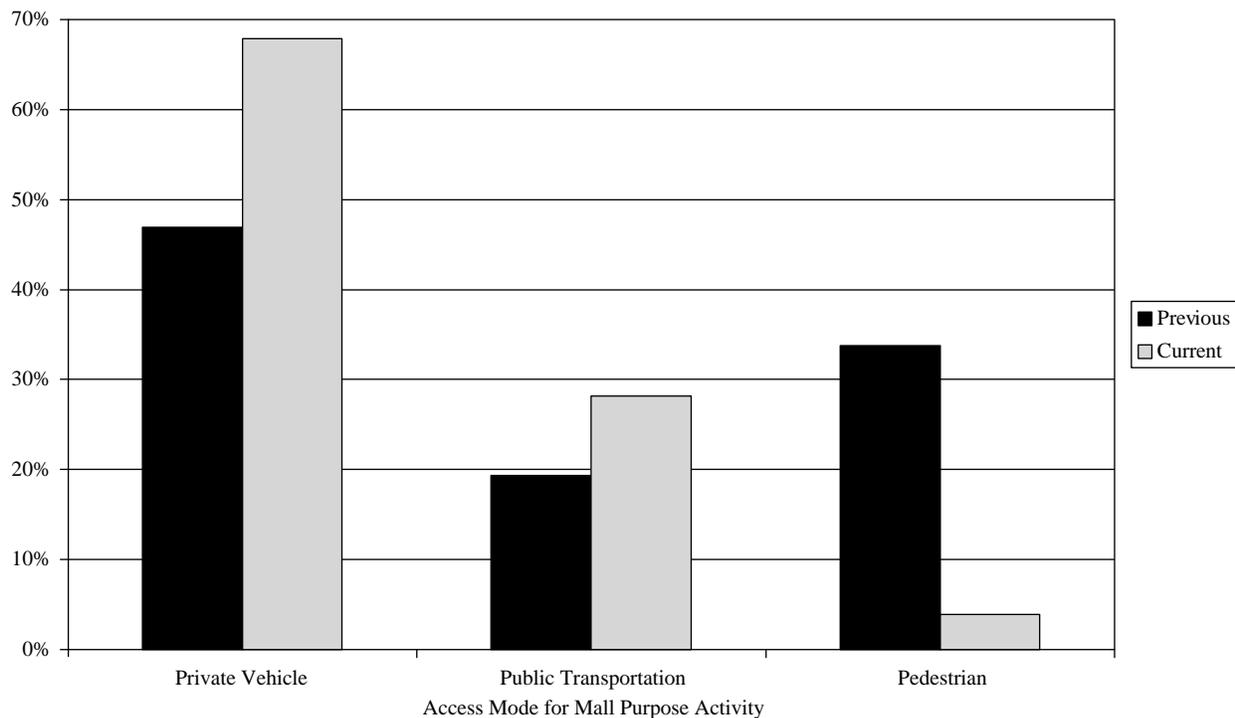


FIGURE 4 Mode split.

TABLE 5 Mode Share by Demographic Characteristics

Characteristic	Category	Mode Share						Number of Records	
		Private		Public		Pedestrian		Total	
		Previous	Current	Previous	Current	Previous	Current	Previous	Current
Age Groups	70+	25.5%	47.4%	30.8%	50.5%	43.6%	2.1%	96	97
	60-69	33.6%	54.3%	19.1%	40.5%	47.2%	5.2%	116	116
	50-59	45.3%	67.5%	14.6%	29.2%	40.1%	3.3%	241	243
	40-49	51.4%	75.5%	17.3%	19.8%	31.3%	4.8%	261	273
	30-39	57.0%	81.6%	12.0%	14.7%	30.9%	3.7%	344	348
	20-29	48.8%	67.5%	23.1%	29.0%	28.0%	3.5%	405	428
	Under 20	36.8%	46.5%	30.2%	47.9%	33.1%	5.6%	139	144
Gender	Male	55.9%	77.0%	13.3%	19.8%	30.9%	3.2%	727	751
	Female	39.8%	60.2%	24.4%	35.1%	36.0%	4.6%	866	888
Income	Below Average	33.3%	53.9%	22.2%	41.6%	44.4%	4.6%	207	219
	Average	45.8%	66.9%	20.1%	28.8%	34.1%	4.3%	1139	1208
	Above Average	67.8%	88.1%	10.9%	10.3%	21.3%	1.5%	174	194
Car Ownership	No Cars	9.9%	17.1%	38.5%	76.2%	51.6%	6.7%	252	269
	One Car	50.3%	74.8%	16.5%	21.1%	33.2%	4.1%	892	944
	Two Cars	63.7%	87.3%	12.8%	11.7%	23.5%	0.9%	289	316
	More than Two Cars	64.9%	81.9%	13.0%	16.9%	22.1%	1.2%	77	83
Household Size	One Person	42.2%	66.4%	16.1%	30.2%	41.7%	3.4%	318	324
	Two Persons	50.5%	69.1%	20.9%	28.7%	28.7%	2.2%	399	408
	Three Persons	48.0%	71.9%	19.2%	22.7%	32.8%	5.4%	464	481
	Four Persons	52.1%	68.7%	19.0%	25.7%	28.8%	5.6%	239	249
	More than Four Persons	50.1%	70.1%	23.2%	26.4%	26.7%	3.5%	84	87

51% increase in the private vehicle mode share, whereas men saw a 38% increase.

### Income

The mode shares show distinct changes across income groups, with less affluent groups shifting to transit after the introduction of the mall and more affluent groups favoring private vehicles. The below-average income group showed the highest percentage growth for both private vehicle and public transit modes, 62% and 87%, respectively. The average income group demonstrated lower growth rates for private vehicle and public transit modes of 46% and 43%, respectively. The above-average income patrons showed a 6% decline in their use of transit after the introduction of the malls.

### Car Ownership

Changes in mode choice related to the introduction of the malls differed considerably across groups by car ownership. Not surprisingly, patrons from households without cars report almost doubling their public transit mode share from 39% to 76%. More surprisingly, this group also saw the largest percentage increase in the private vehicle mode share, which rose from 10% to 17%.

In general, the growth rates in the private vehicle mode decreased with the number of vehicles in the household.

### Household Size

Household size appears to have only a small influence on mode choice to the mall.

## CONCLUSIONS

The rapid introduction of fringe shopping centers in Prague between 1997 and 2001 has distinctly altered the shopping travel behaviors of patrons. This research presents data gleaned from surveying patrons at four new malls. The major findings are that with the introduction of the new shopping centers on Prague's fringe, on average, mall patrons' shopping trip frequency has decreased while shopping activity duration has increased. These mall patrons reported a radical mode shift away from pedestrian access toward motor vehicle modes. Although there was a moderate increase in public transit use, the steepest shift was toward private vehicle access.

These changes affected different population groups differently. Most notably, weaker segments of the population, namely, the elderly, the low income, those with less access to private vehicles, and those with larger household sizes, saw the largest reductions in trip frequency with the introduction of the malls. These groups composed the bulk of the shift toward public transit. By contrast the stronger segments of the population, namely, younger adults, the high income, those with excellent access to private vehicles, and those with smaller households, saw an increase in their shopping duration and their use of private vehicles. Uniformly, respondents reported a substitution of walking trips with vehicle trips. This finding is important because it suggests that even the wealthy would walk to shopping locations when convenient.

The creation of fringe malls in Prague and, by extension, in other cities in central and eastern Europe appears to recast the retail land-

scape in favor of private vehicles. This trend threatens the urban vibrancy of traditional centers and neighborhoods through a new reliance on less sustainable travel modes. The benefits of these new retail options appear to fall disproportionately on the strongest socio-economic groups, which have the travel means to access the fringe locations.

Although these trends should spark concern among planners seeking to preserve traditional communities where they already exist and to provide more equitable access to the benefits of development, the second wave of mall building in Prague may offer some solace. Built in infill locations closer to the city center and adjacent to rail transit resources, the newest malls represent the construction of a different, more integrated landscape. Although research will need to be undertaken to assess their impacts, this new model appears to be a more effective way to combine the desire for retail investment with the hope of maintaining sustainable cities.

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