

9 The impact of retail deconcentration on travel to hypermarkets in Prague

Yaakov Garb¹

Blaustein Institutes, Ben-Gurion University of the Negev, Sede Boqer Campus, Midreshet Ben-Gurion 84990, ISRAEL and Institute for Transportation and Development Policy (New York)

Abstract: This chapter provides the first comprehensive examination of the impact of retail decentralization on shopping travel and visitation patterns in post-communist Prague. Based on surveys of the current and prior shopping patterns reported in 2001 by shoppers in four recently opened hypermarket malls, the analysis shows how the transition to hypermarkets has affected shopping behaviour, and provides a detailed picture of current shopping trips, including an estimate of their contribution to total travel, and a multivariate analysis of the factors shaping trip length, mode, and frequency. The policy implications of these findings within the broader Central-European context are discussed

Key words: Retail, deconcentration, hypermarket, post-communist cities

9.1 Introduction

The first form of deconcentration in the wake of the political transition in the Central European countries (CEC) was the rapid exodus of retail from the traditional city core. Under the previous regime, retail was limited, government owned, and centralized not only spatially (in city centres of the larger cities) but also administratively. Stock, management, pricing, staff, and so forth were all centrally controlled. Beginning in the mid 1990s, however, and within less than a decade, a substantial portion of retail purchases was taking place in hundreds of hypermarkets. These are large (sales space of over 2500 m²), modern, and highway-dependent malls. Many of them were located at the edge of or even outside the municipal boundaries of major CEC cities; almost all of them were leased by foreign owners to large West European retail chains. This revolution in retail format, scale, ownership, and location has become emblematic of the transition from Socialism in the CEC.² Unlike the more familiar pattern in developed countries, in central Europe 'big box' shopping was at the leading edge of deconcentration, preceding rather than following residential and job sprawl.

This chapter provides the first comprehensive examination of one key aspect of this revolution: its impact on shopping travel and visitation patterns. These have traditionally been a major concern with respect to retail deconcentration; the chapter places them on a firm empirical footing with particular respect to the Central European setting. Surveys of the current and prior shopping patterns reported by

shoppers in four Prague malls, both inside and outside the city boundaries, provide detailed insight into this key element of retail deconcentration. The survey reported here was conducted in the first malls established in Prague about 3-4 years after they opened. Thus, prior (pre-mall) shopping patterns were still relatively fresh in people's memories and were captured in these surveys. In this way, we are able to see in detail how the transition to hypermarkets has affected shopping behaviour.

Examination of the consequences of the transformation of retail is important in itself, as an important component of urban change in post-socialist cities is thereby illuminated. Furthermore, such an examination can not only help us understand past impacts in the CEC, but also anticipate future impacts as retailers move from the major cities (where retail markets are becoming saturated) to the smaller towns with fewer than 100,000 inhabitants, which are the new target of the large retail chains. This analysis of impacts is also relevant for other post-socialist cities to the south (the Balkans) and the east (Russia), where a similar process is taking place, albeit more slowly. (At the end of 2004, Russia had only 0.2 hypermarkets per million inhabitants, several orders of magnitude lower than the Czech Republic's 16 per million (PMR Publications, 2004)).

Current changes in shopping facilities and patterns in response to 'big box' projects in Asia, Latin America, Africa, and elsewhere render the lessons of Central Europe's 'flash malling' useful for transition countries globally. CEE retail patterns are also of interest to urban scholars in Western Europe and North America; the drastic and rapid retail revolution in the CEC provides hindsight into processes that occurred in developed economies in a more subdued form over a longer period. The CEC also provide models of some relatively sustainable niches of retail visitation retained in its cities, which are relatively compact and well served by transit (Garb & Dybicz, 2006).

9.2 The rapid malling of central Europe

After the Second World War, in countries under Soviet influence, the existing retail sector was systematically dismantled and reconstructed according to Marxist-Leninist ideologies and economic priorities (Michalak, 2001). As with other aspects of the economy, the retail sector became state-owned and controlled in most aspects: location, price, purchasing and stock, and staffing (Michalak, 2001). By the end of the 1980s, for example, 80 percent of stores – accounting for over 95 percent of turnover – were state owned (Michalak, 2001: 488). Almost all higher-order retail was located in the centres of the main CEC cities, which were compact and well served by public transport (subway, tram, and bus).³ Other locations (smaller towns, villages, and even the massive housing estates established in 'suburban' locations around the main CEC cities) had only very basic shops.⁴ The provision of goods and foodstuffs at factories, through 'grey' retailing, and through self-sufficient production supplemented the formal retail market, which was notorious for its limited quality and range.

Immediately after the transition, CEC countries had almost no modern retail and certainly no large-format out-of-town stores. In the following few years of initial transformation towards a market economy, retail went through a brief and dynamic stage of local ownership, although somewhat differently in each country. The state-owned retail enterprises were privatized to local CEE ownership on the one hand, and all kinds of *ad hoc* informal retailing sprang up on the other. Very soon, however, large West European retail chains sensed the opportunities in the region. At the time they were experiencing difficulties in their home markets through increased retail competition, market saturation, and zoning regulations that hindered the establishment of new hypermarket facilities. In the mid 1990s, hypermarkets accounted for between 22 percent (Norway) and 70 percent of market share (in France and the UK), whereas in Central Europe there were no hypermarkets. Thus, a highly developed, (even saturated) and also highly capitalized hypermarket system moved into virgin territory in Central Europe; the results were explosive.

In the Czech Republic, for example, the number of hypermarkets rose from practically zero in the mid 1990s to over 150 a decade later (Figure 9.1); the Czech Republic now leads Central Europe in hypermarket penetration. The percentage of modern retailing in hypermarket format rose rapidly from zero, soon reaching almost 50 percent (Dries et al., 2004). The share of foreign ownership in the top 50 retail trade companies rose from under 20 percent in 1993 to 80 percent in 2001 and has continued to rise. Thus, hypermarket retail is now entirely dominated by multinationals (some key players are the German Metro/Makro, the British Tesco, and the French Auchan and Carrefour); domestic chains have survived to a somewhat greater extent in Hungary and Poland.

The entry of these multinational companies into Central Europe was facilitated by the logistic convenience of their geographic proximity, coupled with their cultural similarities with Western Europe, which led to a fluent working relationship of CEE stores with their West European headquarters. At the same

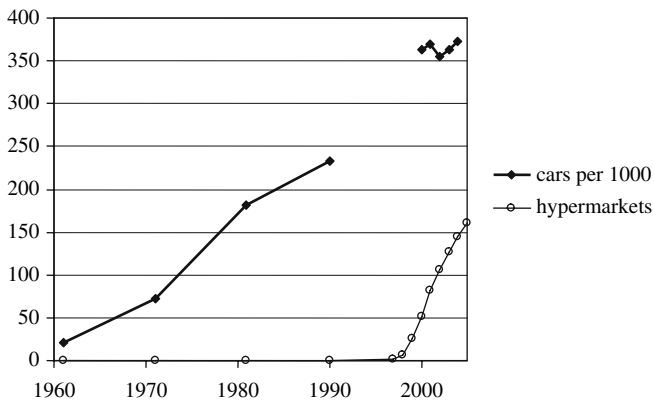


Fig. 9.1 Growth of motorization and hypermarkets in the Czech Republic⁵

time, the prospect of these countries joining NATO and then the European Union reassured Western investors of the likelihood of political stability and a rise in purchasing power. The hypermarkets were unstoppable: a key characteristic of socialist economies was the limited range and amount of commodities, and the great difficulties in obtaining even these, so the modernization of retail was symbolically the leading edge of the new political and economic freedoms.

Given central Europe's compact cities, excellent urban public transport, and predominantly urban customers, market forces alone might have encouraged the more central location of new retail facilities, close to the majority of the population and transit services. However, various aspects of post-socialist urban real estate and planning procedures rendered the siting of large modern retail facilities in town centres or sub-centres nearly impossible. Much of the hypermarket development was steered into off-centre or out-of-town locations in a fairly unregulated manner.

The difficulties in siting modern retail facilities in post-Communist cities included the constraints imposed by the lack of clarity with respect to the ownership status of re-privatized properties, the blockage for various reasons of large vacant or underused land (Jackson & Garb, 2002; Garb & Jackson, 2006), and the lengthy and uncertain procedures to change zoning status to allow retail activities. In contrast, large retail facilities were welcomed on greenfield sites in many small communities surrounding large cities. These had independent planning powers and competed with one another for the jobs anticipated from large retailers. Changing zoning involved far less bureaucracy in villages than in Prague and local mayors and councillors were lured by the prospect of land sales. The massive capitalization of international retailers relative to the incomes of civil servants also led to bribery to override residual attempts at land-use regulation. On the regulation side, there was a vacuum. The socialist system had engendered a widespread aversion to central planning in any form, including the regulation of retail location. The reform of territorial government and administration that came into force on 1 January 1991 removed the regional level of governance between the municipal and the national levels, which might have been the natural locus of such retail planning. Rising motorization rates (see Figure 9.1) also facilitated more car-dependent locations. The hypermarkets described below came from this first generation of hypermarkets in Prague, some in out-of-town locations, and others in off-centre infill locations within the Prague municipal boundaries.

9.3

The Prague hypermarkets travel survey

9.3.1

The hypermarkets

Four prominent Prague malls opened in the late 1990s were chosen for this study (Figure 9.2 and Table 9.1, below). These are spread across the city, and range from a classic exurban hypermarket (the cluster of retail development at Pruhonice,

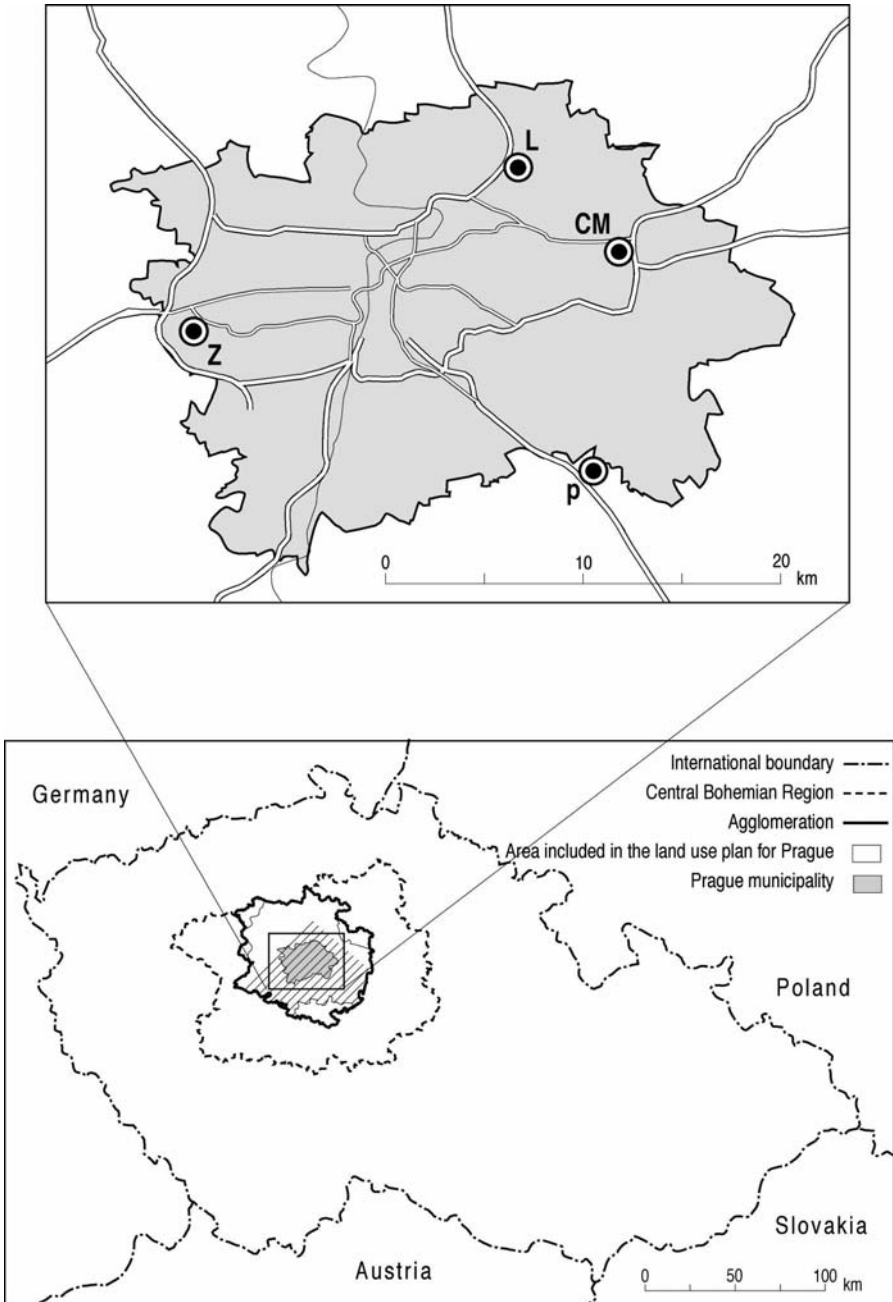


Fig. 9.2 The four Prague malls surveyed, located within the Prague municipal boundaries, the Prague Agglomeration, the Central Bohemia Region, and the Czech Republic. Z=Zlicin; P=Pruhonice; CM=Cerny Most, L=Letnany

Table 9.1 Shopping centre and survey information⁶

Mall information	Survey information (date and number of questionnaires)										
	Location	Centre name	Date opened	Centre style	Gross leasable Area – GLA (m ²)	Hypermarket percentage of GLA	Transit access	On highway or ring road	Relation to residential areas	Thursday	Saturday
	Letnany	Letnany	Nov 1999	Mall	15,000	80%	Shuttle	No	Outside	25 Oct 2001 217	27 Oct 2001 251
		Hypernova	April 1998	Box	16,200	60%				8 Nov 2001 38	10 Nov 2001 45
	Pruhonice	Makro	na	Box	Na	95%	Shuttle & bus	Yes	Outside	8 Nov 2001 106	10 Nov 2001 122
		Spektrum	April 1998	Mall	6,500	0%				8 Nov 2001 24	10 Nov 2001 22
	Cerny Most	Centrum	Nov 1997	Mall	25,000	38%	Metro, shuttle	Yes	At edge	4 Oct 2001 208	6 Oct 2001 193
	Zlicin	Shopping Park Praha	Nov 1998	Plaza	47,400	33%	Shuttle, metro	Yes	Outside	18 Oct 2001 189	20 Oct 2001 234

a ribbon sprawl development just outside the Prague municipal boundaries) to a more accessible mall, closer to the city centre and a residential neighbourhood. Two of the hypermarkets (Zlicin and Cerny Most) are located on opposite termini of a central subway line. Zlicin and Pruhonice are out-of-town malls: the former on the interchange of Prague's southwest radial highway with Prague's ring road, and the latter located on the southeast radial highway toward Brno, immediately outside the city boundaries.

9.3.2 The survey

The survey was conducted in October and November of 2001 via a questionnaire with 1649 respondents at 6 shopping centres located at the four different mall locations identified above (see Table 9.1 for the dates and number of questionnaires for each mall). Roughly 400 questionnaires were administered at each of the 4 sites on one weekday and one weekend day for each shopping centre. The distributors were instructed to circulate throughout the public areas in the shopping centres and approach individuals or groups to request their participation. In the case of a group, the person who responded completed the questionnaire. Our survey probably represents slightly less than one percent of the total daily visitation to these 4 malls, capturing 30,000 km of travel from places within the Prague agglomeration boundaries and an additional 45,000 of travel from further away.⁷

The questionnaires were designed to yield the following information:

1. Demographic information about the respondent (including age, gender, income ranking, household car ownership, household size).
2. Information about the trip that brought them to this shopping centre (the locations of the origin from which they came and their post-mall destination, what kinds of activity preceded and would follow the mall visit, how much time their incoming and outgoing trip would take, how long they anticipated staying or had stayed at the mall, how much they expected to spend there, their primary and secondary purposes for the trip, and how many times a month they came to this mall).
3. Information about the characteristics (mode, duration of visit, frequency) of the trip they used to make for the same purpose as their present trip prior to the existence of the new shopping centre.

This survey relies on several assumptions, which can be refined in follow-up studies. Thus, respondents' memory of prior shopping activity was assumed to be reliable (a reasonable assumption, since the malls had only been open for 2 to 4 years at the time of the survey), and that shopping was sufficiently habitual for the current trip to be representative of the visitors' usual shopping habits. In addition, in future work, possible overrepresentation in the survey of the weekend days and the smaller malls could be examined and compensated for, if necessary, by an appropriate frequency weighting.

The remainder of this chapter reports our analyses of the results of the survey, with special attention paid to three key characteristics of hypermarket use and travel: travel mode, trip distance, and shopping trip frequency. These indicators are crude, but important measures of the environmental and quality-of-life impacts of the shopping patterns captured in the surveys, and of the transition to these from shopping patterns reported to have prevailed prior to the use of the current mall.

Table 9.2 summarizes the key bivariate relationships of the key trip parameters in 26 comparisons of the difference in means of each parameter between subgroups for each of the independent variables. The findings are summarized in this way because they largely confirm the responses we expected of trip distance, mode, and frequency to various independent variables. The surprises here lie in the extent rather than the direction of these differences, and in the relationships that do not appear in the table: the relative unimportance of gender, for example.

Each of these three key trip characteristics is discussed further in a separate section, where a formal multivariate regression analysis is presented that explains between 34 percent and 44 percent of the variance of each trip characteristic⁸. In subsequent sections we discuss how these parameters changed in the transition to hypermarket shopping, and the striking absence of trip chaining.

Table 9.2 Bivariate relationships of key trip parameters

Trip parameter	Influencing factors and indicative examples (all significant at the 0.0001 level)
Distance (average round trip: 21.4 km)	<ul style="list-style-type: none"> • Travel mode (car trips on average 20 km longer than pedestrian trips) • Current shopping frequency (trips undertaken biweekly or less average 12 km more than trips undertaken weekly or more) • Duration of mall visit (stays of over 2 hours average 10 km longer than stays of under one hour) • Mall Location (Zlicin trips on average 9 km longer than Letnany trips) • Prior frequency of shopping (trips undertaken biweekly or less on average 7 km more frequent than trips undertaken weekly or more often) • Grocery vs other trip purpose (non-grocery trips on average 6 km longer than grocery trips) • Purchase amount (visits with expenditure over 1000 crowns on average 5 km longer than those of under 1000 crowns) • Day of week (weekend or weekday) (Weekend trips on average 4 km longer than weekday trips)
Travel Mode (overall percent coming by car: 68%)	<ul style="list-style-type: none"> • Availability of car (17% of those in car-less households come by car versus 75% of those having one car in the household) • Mall expenditure (39% of the group spending under 500 crown, come by car versus 88% of the group spending over 1000 crowns)

- **Reported income** (89% of those reporting above average income come by car, versus 65% of the rest)
- **Distance** of trip (39% of those traveling under 6.5 kilometers round trip come by car, versus 72% of those traveling over 6.5 km)
- **Mall location** (57% of shoppers at Letnany come by car versus 90% of those at Pruhonice)
- **Age** (46%-49% of those over 62 or under 21 come by car versus 83% of those in the 29-42 age bracket)
- **Prior shopping mode** (32% of those who used to shop by public transport prior to the mall's existence now shop by car versus 92% of those who used to shop by car)
- **Frequency** (72% of those who come biweekly or less shop by car, versus 53% of those who shop weekly or more)
- **Gender** (60% of women versus 77% of men come by car; note: 71% of the car drivers are men, and only 15% of car passengers)

**Frequency
per month**
(average
monthly
frequency:
3.6)

- **Number of passengers** in the car (those without a passenger come 3.1 times more than those with one or more passengers)
- **Mode** (pedestrians come 2.6 times more on average than those who come by public transport, who, in turn, come 0.5 times more often than those who come by car).
- **Distance** (those traveling under 11 km come 2.0 times more than those traveling over 11 km)
- **Prior frequency** of shopping (those who used to shop weekly or more now average 1.8 times more than those who used to shop biweekly or less)
- **Travel time** to mall (those traveling 15 minutes or less come 1.6 times more than those traveling 30-45 minutes)
- **Mall location** (Shoppers at Cerny Most come 1.1 times more than those at Zlicin)
- **Is public transport available** (those who declare that public transport is available for their trip come an additional 1.0 time a month more than those who do not)
- **Duration** of mall stay (those who spend under an hour come an additional 0.8 times a month compared with those spending between one and two hours)
- **Used to shop locally** (those who used to shop locally now shop an additional 0.6 times more than non-local shoppers)

9.4 Trip distance⁹

In addition to describing the analysis of the factors influencing trip length, in this section we discuss two important findings that have emerged from the study of the distribution of hypermarket travel distances: the presence of long-distance

shopping and the large overall amount of hypermarket shopping in absolute terms, which can be estimated by linking the survey results to comprehensive 24-hour traffic counts at one of the malls.

9.4.1

The long distance surprise: Non Prague-based trips

As might be expected, the overwhelming majority of trips to the malls are Prague-based (PB); that is, they originate within the city of Prague or the Prague agglomeration—a ring about 30 km wide surrounding Prague that is used for functional analyses of the city (Figure 9.2). However, 15 percent of all trips *to* the malls and 14 percent of all trips *from* them (especially to/from Zlicin and Cerny Most) are from locations outside the Prague agglomeration. Since almost all the trips that have one trip end outside the agglomeration also have their second end outside, the number of trips having at least one terminus outside the agglomeration comprises 16.4 percent of all trips.

These non-Prague-based (non-PB) trips are distinctive and have striking implications for overall hypermarket travel. Over 91 percent of them are made by car (compared with 63 percent for Prague-based trips), and they average ten times the distance of PB trips: 99 km one way compared with 10.5 km for PB trips. For this reason, although non-PB trips constitute only 16 percent of overall hypermarket trips, they account for 50 percent *more travel* than the 84 percent of trips that come from within the Prague agglomeration (45,000 km of round-trips versus 30,000 km)!

Figure 9.3 shows the distribution (including average, median, inter-quartile range, and outliers) of roundtrip distances (in metres) of all trips, including those from outside the Prague agglomeration (on the left), and of the PB trips only (on the right).

In the diagram on the left (Figure 9.3), the non-PB trips are represented by the outer hump, the location of which is misleadingly close to the central hump. This closeness occurs because the travel modelling software replaces the actual

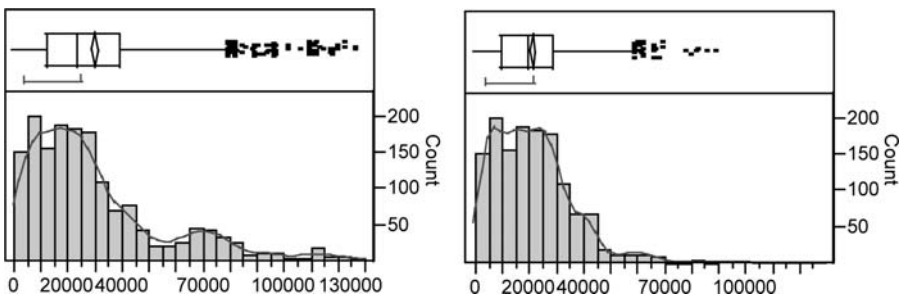


Fig. 9.3 Distribution of roundtrip distances (in m) for all trips (left) and Prague-based trips (right)

origin/destination of these trips with their point of entry to/exit from the Prague agglomeration. The distances representing non-PB trips in the data file distances are therefore drastically truncated. The true (and much longer) distances were derived separately from air-distances to the origin/destination points rather than the traffic model's network distances; they are shown in Figure 9.4.

This histogram provides a more accurate representation of the travel lengths, which appear with truncated values in the outer hump of the bimodal distribution in the previous figure. Whereas trips within the Prague agglomeration are clustered around a 21 km average (10.5 km each way), trips from outside the Prague agglomeration are distributed around an average distance ten times further away: a trip of just under 200 km on average (99 km each way). Half the non-PB trips are between 86 and 160 km one way. The distribution of non-PB trips is, obviously, truncated to the left, since shorter trips are registered within the Prague agglomeration and do not appear here. Beyond these two humps is a third distribution: a long thin tail of 28 trips (1.7 percent of the total sample) of over 350 km round trip (175 km each way) whose frequency does not decline until beyond 700 km round trip. The tail includes trips from Germany (353 km) and Slovakia (340 km).

In contrast with the PB trips, the non-PB trips are very sporadic (52 percent occur once a month or less compared with 16 percent for PB visitors); understandably, they are not standard grocery shopping trips. Only 35 percent of the non-PB

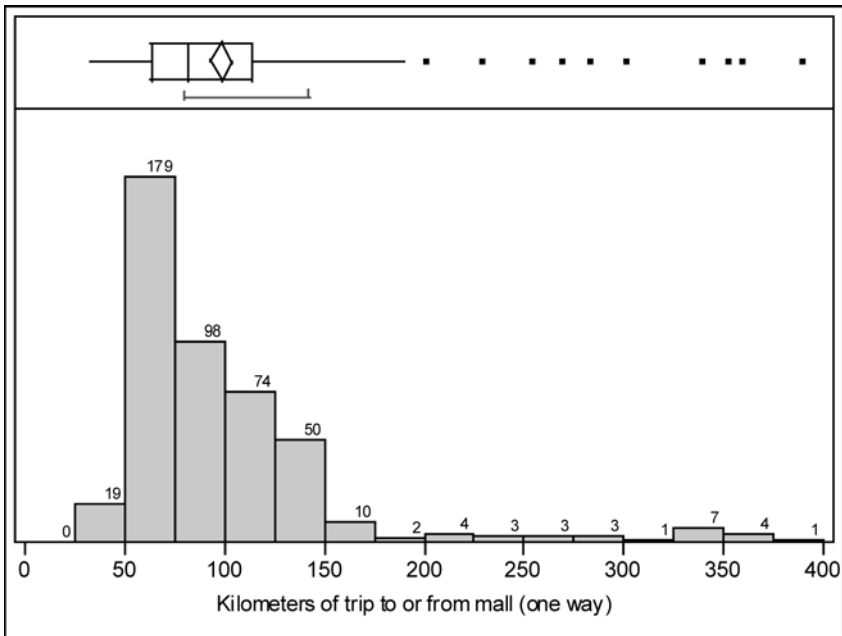


Fig. 9.4 Number of trips and one-way trip distance for non-Prague based trips

shoppers come for groceries (compared with 62 percent for the Prague-originating trips) and 7 percent are at the mall for work purposes (compared with 4 percent for PB visitors). Non-PB visitors stay for much longer; 38 percent stay for 2 hours or more (compared with 17 percent for PB visitors); and they spend more money than PB visitors. Not surprisingly, the overwhelming majority of these long-distance non-PB incoming trips originate at home (90 percent compared with the already high 85 percent of Prague-based trips). What is surprising is that 84 percent declare their post-shopping purpose also as ‘home.’ This is probably the case, but we must phrase trip-chaining questions very carefully to capture all stops, since it is difficult to imagine driving such distances to Prague and back without adding on a visit to other places in the city.

The long-distance trips discussed here probably represent an intermediate phase of retail deconcentration, with modern retail facilities located primarily in the capital city, so that people were willing to make a round trip from and to home of a hundred kilometres or more in order to shop at Prague malls.

Because of the methodological difficulties of merging the distance data of trips outside the scope of the traffic model with the rest of the dataset, and because these trips seem to be fundamentally different in kind, the non-PB trips have not been included in the further analyses of trip distances in reported here. The remainder of this chapter is a study of the travel behaviour of mall trip-making *within* the Prague agglomeration.

9.4.2 Regression model of trip length

A model accounting for 34 percent of the variance in roundtrip travel distance is given by the following nominal logistic regression (Table 9.3). Three factors alone account for 29 percent of the variance: (1) whether the trip origin is in/outside the municipal area; (2) trip mode; (3) shopping frequency.

Table 9.3 Regression coefficients for trip length model

Term	Std. beta	Prob> t
Intercept	0	0.0000
From Prague municipal area [No]	0.339	0.0000
Shopping frequency group {Two or less/month—3 or more}	0.223	0.0000
Primary purpose is groceries [No]	0.133	0.0000
Shopping frequency group {3 or 4/month —Four or more}	0.073	0.0015
Duration of mall stay {Up to one hour—One to two hours}	-0.077	0.0005
Mode {public transport-private vehicle}	-0.103	0.0000
Mode {Pedestrian—public transport & private}	-0.134	0.0000
Duration of mall stay {Up to two hours—over two hours}	-0.166	0.0000

Overall F ratio of 87.4, $p > 0.0001$, R^2 adj. 0.34, $n = 1359$.

There are some statistically significant influences on distance from some other bivariate variables, including the mall in question, age groups gender, and purchase amount (see Table 9.2). These relationships are, however, smaller or else test as insignificant in combination with other variables in a multivariate model. Car ownership does not influence trip distance directly, but through its influence on trip mode (trips made by car are somewhat longer).

9.4.3 Estimating overall generated travel

We can approximate the travel generation of the hypermarkets studied in absolute terms through linking the distances travelled in the population sampled in one of the malls, Shopping Centre Praha (Zlicin), with the total number of daily (24 hour) visitors to this mall.¹⁰ The distance travelled in the Prague agglomeration trips sampled in this mall totalled 3,651 km on the weekday and 5,014 km on the weekend day. The total distance is slightly inflated by ignoring the fact that a small part of these shopping trips were added onto existing trips, but is greatly under-represented by excluding the far larger amount of travel that was not from the Prague agglomeration, most of which is reported to have been expressly for shopping.

Comparing the number of weekday and weekend day visitors in the questionnaires with the full daily count, we find that the sample in this survey represented 1.0 percent (weekday) and 0.7 percent (weekend day) of the total visits over the full day. Thus, the overall travel generated by this mall would be 354,250 km on a weekday and 716,448 km on a weekend day, yielding some 167 million km a year. This figure is reduced a little if we eliminate the days on which the malls are closed through holidays or travel is reduced through bad weather. These numbers accord with calculations derived in a different manner for a large mall in Warsaw (Garb & Dybicz, 2000). Assuming 0.2 kg of carbon produced per kilometre of car travel, even if we were only to include those 38 percent of total trips made by car drivers, this mall would produce over 12,000 cubic tons of carbon annually.

Given the 80 shopping centres in the Czech Republic when these surveys were made (Dragomir, 2001), hypermarket travel would have been responsible for 13 billion km of travel, and a million tons of carbon in the Czech Republic during the year of this study: 3.5 percent of total CO₂ from all fossil fuels in the Czech Republic. Even if we were to halve this number, because not all the 80 shopping centres nationwide are as large as Shopping Centre Praha and neither do they have this mall's average trip-distance (which is about 50 percent greater than an in-town mall), hypermarket shopping would still seem to be a significant source of travel and emissions.

9.5 Frequency

A model accounting for 30 percent of the variance in shopping trip frequency is given by the regression whose terms are shown in Table 9.4.

While the variable ‘cars in household’ is a statistically significant predictor, it contributes less than one percent to the explanation of variance. I have nonetheless included it in the model, because it remains significant even when travel mode and income are included in the model.

9.6 Travel mode

One can account for a good deal (44 percent) of the variance in mode choice with the six variables discussed below. In fact, 35 percent of the variance in mode can be explained by three variables: car ownership, pre-mall shopping mode, and shopping frequency.

The overall regression model for the choice between trip modes is given in Table 9.5. As expected, the following variables influence the choice of cars over public transport:

- a car in the household;
- larger purchases, of over 1000 crowns (\$27 at the time of the survey): note that this effect can be shown to be separate from the effect of income, and does not seem to affect the choice of pedestrian over public transport;
- whether shopping before the existence of malls was done by car;
- whether the trip originated outside the Prague municipal area.

Table 9.4 Regression coefficients for trip frequency

Term	Std. Beta	Prob> t
Intercept	0	0.0000
Pre-mall frequency of shopping (monthly visits)	0.205	0.0000
Mall expenditure over 1000 [Under 1000 crowns]	0.160	0.0000
Day of week [Weekday]	0.123	0.0000
Persons in household	0.089	0.0014
Cars in household	0.070	0.0150
Primary purpose of mall visit [Entertainment/sport]	-0.064	0.0303
Income above average [not above average]	-0.095	0.0006
Primary purpose of mall visit [Groceries]	-0.103	0.0006
Primary purpose of mall visit [Other purchases]	-0.213	0.0000
Round trip length (m)	-0.267	0.0000

Overall F ratio of 43.8, $p > 0.0001$, R^2 adj. 0.29, $n = 1050$.

Table 9.5 Regression coefficients for nominal logistic regression of trip mode

For Log Odds of	Term	Estimate	Standard error	Chi ²	Prob>Chi ²	
Car / Public transport	Intercept	0.42	0.35	1.5	0.2230	
	Mall expenditure [Under 1000 crowns]	-0.76	0.11	51.3	0.0000	
	Round trip length	-0.0000032	0.000009	0.1	0.7065	
	Pre-mall shopping mode [Private car]	1.56	0.16	91.1	0.0000	
	Pre-mall shopping [Public transport]	-1.51	0.15	103.2	0.0000	
	From Prague municipal area [0]	0.45	0.16	7.7	0.0056	
	A car in the household? [No]	-1.50	0.15	94.2	0.0000	
	Monthly mall visits	-0.05	0.04	1.5	0.2245	
	Pedestrian/ Public transport	Intercept	-1.25	0.69	3.2	0.0719
		Mall expenditure [Under 1000 crowns]	0.005	0.28	0.0003	0.9867
Round trip length		-0.0002554	0.000046	30.2	0.0000	
Pre-mall shopping mode [Private car]		0.49	0.36	1.8	0.1793	
Pre-mall shopping [Public transport]		-0.63	0.30	4.5	0.0340	
From Prague municipal area [0]		-0.04	0.44	0.008	0.9271	
A car in the household? [No]		-0.53	0.20	7.1	0.0077	
Monthly mall visits		0.29	0.08	13.7	0.0002	

Overall model R²=0.44, Prob<0.0001, n=1041, full model Chi² 734.6.

Travel to malls on foot is chosen over public transport when there is no car in the household, for shorter distance trips, when shopping was done by public transport before the mall’s existence, and in line with increasing shopping frequency.

The following results from this regression analysis are striking: distance *cannot* be shown to be capable of affecting the choice of car over public transport; whether an origin is inside or outside the municipal area, which strongly affects the choice of car, does *not* affect the choice of travel on foot over public transport; the absence of a car in the household *decreases* the likelihood of a trip being made on foot rather than by public transport (that is to say, once a trip is made other than by car, ownership of a car increases the likelihood of making the trip on foot). Also striking is the conservative nature of mode choice: that is, the pre-mall shopping travel mode influences the current choice of car over public transport more than current car ownership does.

Some other variables not included in the regression equation also show statistically significant relationships with mode choice. However, with the exception of *which* mall is visited, these variables do not explain more than a few additional percentage points of variance. For example, the day of the week affects the on foot/transit decision (with an increased likelihood of trips on foot on weekdays), but not the car/transit decision. Gender affects the car/transit decision (an increased likelihood of women using transit), but not the on foot/transit decision. A higher *frequency* of pre-mall shopping trips increases the likelihood of car trips (over and above the effect of pre-mall mode), but has no effect on the on foot/transit choice. However, while these effects are statistically significant and sometimes conceptually intriguing, they do not account for much of the variance.

9.7 Summary of regression findings

Figure 9.5 summarizes the multivariate regressions for each of the three key travel parameters (shopping trip distance, mode, frequency). This diagram should not be taken as a formal structural model, but as a convenient way of summarizing a large amount of information about what is and is not found in these regressions. It is important to note not only the factors that account for a good portion of the variance in each of the three (boxed) main trip parameters, but also the following: variables that are not capable of explaining any of the variance, and are thus not included in the diagram (gender or the reported availability of public transport for the trip, for example); whether variables explain the variance for only one parameter (visit duration only relates to distance, but not to mode or frequency, for example), or for two variables (trip purpose relates to both distance and frequency, but not mode). No variable occurs in the model of all three parameters. It is also

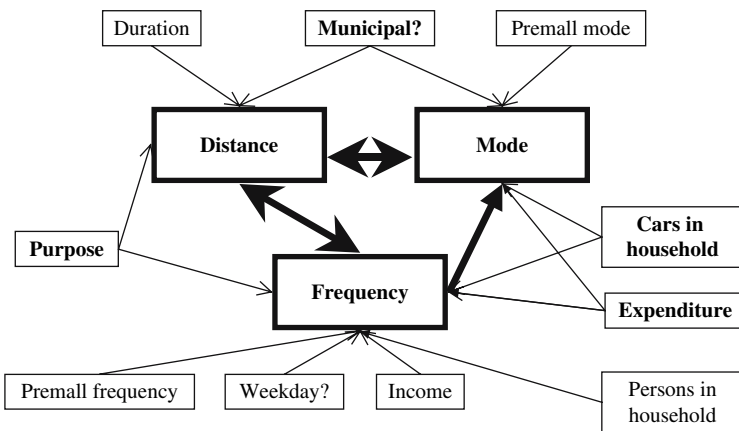


Fig. 9.5 Summary of multivariate regression findings

interesting to note the variables that remain influential despite the presence of what can be assumed to be mediating variables: for example, whether or not the trip is from within the municipal area of Prague (presumably well-served by public transport) affects trip mode even when travel distance is in the equation.

9.8 A striking lack of trip chaining in Prague shopping trips

The extent to which hypermarket visits feature in trips made for other purposes (trip chaining) rather than as the object of a dedicated trip must be an important part of the analysis of the impacts of hypermarket use and location. While the questionnaire was not designed to address trip chaining behaviour specifically, some surprising initial insights can be obtained.

Since weekday trips were only sampled in the afternoon, we could only examine chaining on the way home. We could not ascertain how many people stop at the hypermarket in the morning on their way to their day’s activity. An examination of afternoon chaining, however, suggests that trip chaining plays a lesser part than we might anticipate. Thus, a stop-off on the way home from work occurs in only 11 percent of trips. These are divided almost equally between men and women; there is somewhat more chaining later in the afternoon. Thus, even during this time window of the return commute home, 79 percent of trips are reported to be made from and returning to home (57 percent of these by women). And, as Table 9.6 shows, the questionnaire responses reveal that shopping trips are overwhelmingly special-purpose trips from home and back. Only one of the malls (the Hypernova at the Pruhonice location) had 22 percent of the shoppers stopping there on their way home from work on the Thursday; however, this share was equal to just one half a percent of all the trips in the whole survey.

These findings are surprising in light of the fact that, in the literature on trip chaining in developed countries, work trips have come to be seen as an organizing element for household travel onto which other purposes, such as shopping, are added. While the results in this new and dynamic sub-area of travel analysis are still quite varied, they would lead one to expect a greater portion of linked trips. In the US, the National Personal Transportation Survey (NPTS) reports that 61

Table 9.6 Distribution of trips among various chaining types

Total %	Home to home	Home to other	Work to home	Work to work	School to school	Other to home	Other to other	Total
Row %								
Weekday	36.29	1.46	4.95	0.95	0.25	1.02	1.14	46.07
	78.79	3.17	10.74	2.07	0.55	2.20	2.48	100
Weekend day	46.76	2.54	0.19	1.02	1.14	0.57	1.71	53.93
	86.71	4.71	0.35	1.88	2.12	1.06	3.18	100
Total	83.06	4.00	5.14	1.97	1.40	1.59	2.86	100

percent of women and 46 percent of men make at least one stop on the way back from work (McGuckin & Murakami n.d.). Adiv reports that, on average, women make 2.1 stops on their work-to-home trips and men 1.8 (Adiv, 1983, as reported in McGuckin and Murakami n.d.). A major empirical review that aggregates 33 different household surveys comprising over 33,000 cases in the UK reports that 'only' 40 percent of main food shopping trips are linked.¹¹ Another surprising finding in the Prague survey in the light of the literature is that gender does not seem to have a significant effect on the kind of travel chain in which the shopping trip is embedded.

The implications of the foregoing are that shopping trips indeed *generate* travel rather than form part of or deflect existing travel. This finding underscores the environmental impact of retail travel and the associated choices of travel distance and mode. In Warsaw the significant portions of mall trips that are chained are closer to US and UK experience. The extremely low level of chaining that takes place in Prague remains a mystery.

9.9

The transition to current hypermarket shopping patterns

The sections above include details of the characteristics and factors influencing current mall shopping trips according to the responses of the shoppers in the survey. Some of the most interesting findings, however, are those regarding the reported characteristics of the equivalent shopping trips undertaken 'before this mall was available', particularly what can be derived from them regarding the *transition* from pre-mall to mall shopping. The malls covered in the survey had only been open for between 2 and 4 years before the survey date, so that pre-mall patterns would still have been relatively fresh in people's minds.

We must of course remember that differences between the period before a mall's existence and after its development are functions not only of the mall's presence, but of a lapse in time in a dynamic society. In the years between the opening of these malls (ranging between 1997 and 1999) and the 2001 survey date, incomes and motorization levels rose together with other changes affecting shopping patterns.

As set out below, the main change the survey reveals is that people replace frequent short duration trips, which were mostly not car-borne, with less frequent trips of longer duration made predominantly by car but also by transit. The total number of shopping trips, therefore, has dropped, though we may infer that the distance travelled in these less frequent trips is considerably longer. Trips made by car in the pre-mall period remain car trips; some of those formerly made by transit are lost to the car, while non-motorized trips are virtually eliminated. Mode choice becomes more strictly a function of income. In short, the shopping patterns of those who had cars was not altered much; but in the past, those lacking cars

were likely to shop locally and on foot, and their shopping patterns have been altered radically.

Table 9.7 shows where people used to shop before they began shopping at this hypermarket, and how they used to get there. We can see that pedestrian and bicycle shoppers went predominantly (69 percent) to local retail outlets (local supermarkets or shops), while car-borne shoppers were free to go to predominantly (72 percent) more distant retail outlets (hypermarkets, supermarkets, company shopping clubs, or other centres).

The modified contingency diagram (Figure 9.6) shows the shift in shoppers' modes of travel as they moved from pre-hypermarket to hypermarket shopping. The horizontal axis shows the allocation among modes prior to the mall's existence, while the vertical axis shows the current allocation for each of these population segments. Almost all (92%) of the 47 percent of the people who used to shop by car before continued to shop by car. One third (32 percent) of those who used transit, and over half (56 percent) of those who used non-motorized transport, switched to the car. The switch to non-motorized transport among car and transit users was negligible, while only 8 percent of non-motorized shoppers remained non-motorized. In other words, car users were barely affected by the switch to hypermarkets; the number of transit users fell by one third; while non-motorized shopping trips declined by over 90%.

We can examine this transition from an environmental perspective. About 25 percent of all shopping trips surveyed switched to cars from modes considered more environmentally friendly. The 4 percent regained when car users report moving to more environmentally friendly modes in the switch to malls should be deducted from this. We can, therefore, estimate the additional amount of car travel engendered in the surveyed malls in the transition to mall-based shopping (Table 9.8).

If we project these proportions onto 6.5 billion km of annual hypermarket travel in the Czech Republic as a whole, as previously estimated (roughly, but extremely conservatively), we find that hypermarkets generate 4.6 billion kilome-

Table 9.7 Travel mode and type of former shopping (n=1542)

Col %	Another centre	Company shopping club	Another hyper-market	Another super-market	Local super-market	Local shops	Other
Private car	70	50	78	57	24	24	41
	8	5	23	35	9	9	11
Public transport	22	19	14	26	5	11	41
	6	5	10	39	4	10	26
Walk or bicycle	9	31	8	18	71	65	18
	1	5	3	15	35	34	7

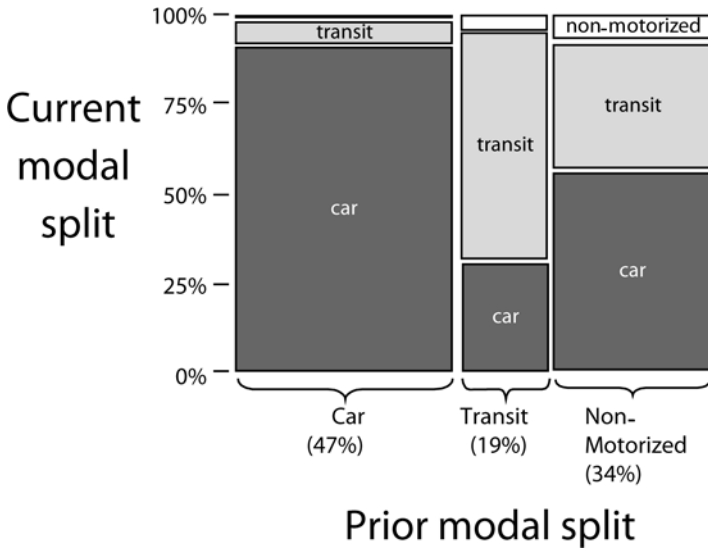


Fig. 9.6 Shifts in travel modes with move to current hypermarket (from Garb & Dybicz, 2005)

tres of car travel annually, 1.3 billion kilometres of which is by shoppers who did not previously use a car to shop.

At the same time, there are now far fewer shopping trips made by these more environmentally-demanding modes. The total **number of trips** made by the shoppers polled in these surveys was 60 percent greater in prior (pre-hypermarket) shopping patterns than currently (that is, the total reported frequencies times the number of people who reported that frequency was 7,614 for the prior shopping pattern, and is 4,663 in the current one).

Income significantly affects the *travel mode* of prior and current shopping, especially for people who shop non-locally. Thus, among pre-mall shopping undertaken *locally*, people whose (current) income is above-average report a somewhat greater amount done by car: 36 percent versus 23 percent (ChiSquare: 6.0, Prob>ChiSq: 0.049). Current income is more clearly reflected in the portion of car trips for shopping that used to be done *non-locally*: The shares are 79 percent for people with above average income and 56 percent for the rest. The respective public

Table 9.8 Breakdown of travel distances captured in survey

Total travel	29,423 km	
Car travel (passenger or driver)	20,766 km	71%
Car travel by people who did not previously shop by car	5,760 km	20%

transport mode shares are 10 percent and 27 percent. For current shoppers, an above-average income all but eliminates non-car travel regardless of whether these shoppers used to shop locally or not; the car travel share jumps from 65 percent to 89 percent (ChiSquare: 50.6; Prob>ChiSq: <.0001). In other words, although these comparisons are based on current income reports, shopping travel mode prior to hypermarkets, especially for shopping that was done locally, may have been significantly less dependent on income than currently is the case, where travel mode is quite sensitive to income.

Shopping **frequency** drops from an average of 5 times a month to 3.6 times a month. The more frequent prior shopping used to be, the greater the amount by which the frequency drops. The extent of the drop is significantly larger for several categories: those who used to shop locally (a drop of 2.4 versus 1.0 for non-local shoppers; prob.< 0.0001); those who used to arrive on foot (a drop of 2.7 versus 0.7); those surveyed at the weekend (a drop in shopping frequency of 1.9 versus 1.2; Prob < 0.0001); those with an above-average income (1.6 versus 1; prob < 0.01); and those spending more than 1000 crowns (1.8 versus 1.2; prob< 0.0007).

There are interesting patterns in the extent of frequency change. While there is very little difference between the shoppers sampled on a weekend and a weekday regarding their prior frequency of shopping (averages of 5.0 and 5.3), there is a larger weekday/weekend difference in the frequency of *current* shopping (3.2 for weekend shoppers versus 4.2 for weekday shoppers), the sharpest average drop was for those who used to shop in local shops (2.9); the drop for those who used to shop in a local supermarket was moderate (1.9); there was almost no change in the shopping frequency of those who shopped in another hypermarket, however (0.3). The matrix of histograms (Figure 9.7) shows that the largest change in shopping frequency is of those who used to shop locally, with far less change in the frequency profile of non-local shoppers. The current shopping patterns of former local shoppers now approximate very closely the former infrequent shopping patterns of those who used to shop non-locally. Those who shopped non-locally in the past now shop even less frequently, with a monthly shop being the most common.

A series of logistic regressions (Figure 9.8) shows the response of trip mode to trip frequency in current trips (top), in prior trips (middle), and in prior local trips (bottom): those trips that used to be to local shops and local supermarkets. The choice to use public transport is relatively insensitive to trip frequency in all cases, while non-motorized and car trips are very responsive to the frequency of prior trips, especially that of prior *local* trips. We also see in these graphs the much larger mode share of non-motorized trips in pre-hypermarket shopping (R square of > 0.1 and Prob>ChiSq: <.0001 in all cases).

As shown in Figure 9.9, **shopping duration** (reported time spent at the hypermarket) stays the same or becomes longer for almost all the trips. (That is, most trips lie to the left of the white-barred diagonal.) Sixty five percent of trips were less than an hour in duration in prior (pre-hypermarket) shopping, whereas only 40 percent are now.

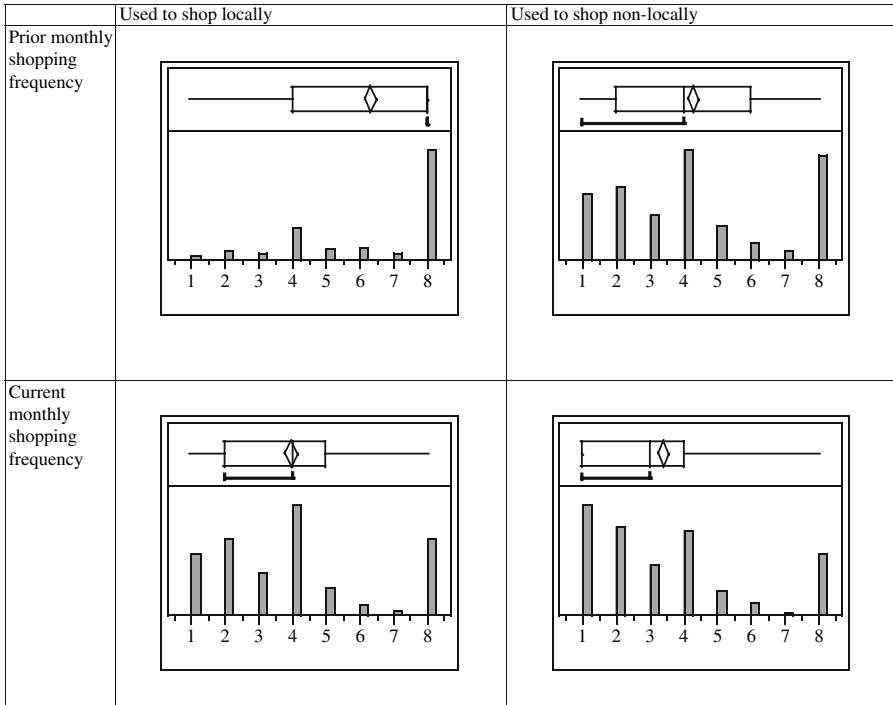


Fig. 9.7 Shifts in shopping frequency in local and non-local shoppers

9.10 Summary, conclusions and discussion

In this chapter, we have presented the key findings of a large-scale survey of shoppers in certain new hypermarkets in Prague. These findings relate not only to shoppers' current visitation patterns in these malls, but also to the patterns reported from a period prior to the mall in question becoming available. This concluding section summarizes these (and several additional findings) in a brief narrative, reflects on their implications for retail location policy, and briefly suggests further work that might usefully be undertaken with this dataset.

The transition to hypermarkets. The move to hypermarket shopping has resulted in people making longer duration shopping trips less often, so that the reported overall number of shopping trips made by the population sampled has dropped by almost 40 percent with the advent of hypermarket shopping. Most of this drop in frequency is a result of the substitution by hypermarket shopping of the one third of shopping that used to be done locally. These former local shoppers used to shop at least once a week, and very often several times a week, overwhelmingly on foot or by bicycle (68 percent) or by public transport (8 percent), and their mode

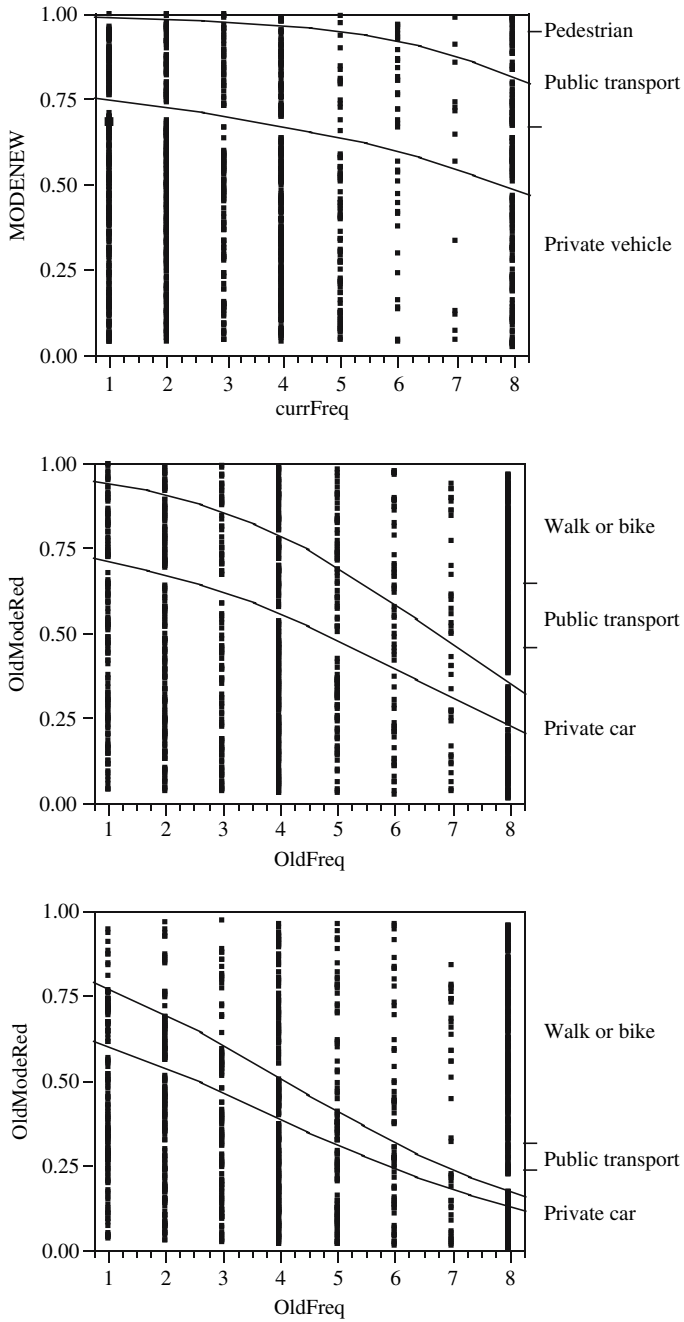


Fig. 9.8 The relation of mode to frequency in current (top), prior (middle), and prior local (bottom) trips

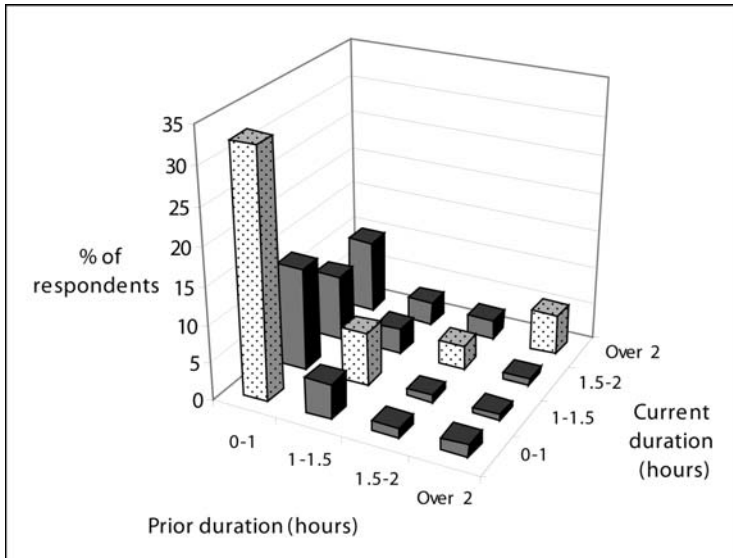


Fig. 9.9 Change in duration of prior-to-hypermarket and current shopping trips (white bars denote identical prior and current durations). N=1554

choice seems to have been far less influenced by income than it now is. In the transition to hypermarket shopping, transit trips were significantly reduced, while non-motorized trips were almost eliminated. For this reason, while the overall number of shopping trips has decreased with the advent of the hypermarkets, the overall amount of motorized trips has increased sharply. Indeed, 20 percent of the car trips made to the malls surveyed are trips that used to be by transit or non-motorized travel: this figure translates into roughly 1.3 billion kilometres car travel annually for the hypermarkets in the Czech Republic as a whole.

Travel distance in current hypermarket visits. A study of the distribution of trip distances indicates three different kinds of trips: those from *within* the Prague agglomeration (84 percent) with an average round trip of just over **20 km**; those 16 percent of trips that either originate in or end *outside* the Prague agglomeration (almost always both), with an average round trip of just under **200 km**, and a very thin (1 percent) but persistent long tail of long distance trips the frequency of which does not decline until about **700 km**. These non-Prague-based trips constitute a real surprise in terms of overall traffic generation, contributing much more travel (50 percent more) than the 86 percent of hypermarket visits considered to be normal Prague-based trips. The absolute amount of hypermarket travel is impressive, in the order of 150 million km a year for the Zlicin mall alone. This figure translates into a conservative estimate of at least 6.5 billion km of annual hypermarket travel in the Czech Republic, 4.6 billion kilometres of which is car travel, which generates something of the order of a million tons of carbon emissions.

Overall regression models of key trip parameters. About a third of the variance in three key trip parameters (distance, frequency, mode) can be explained through selected variables ascertained in the survey (together with two other parameters in each case). The multivariate regressions reveal no great surprise in terms of whatever may affect these parameters, but many small surprises regarding what does *not* affect them substantially, or what remains influential even in the presence of what would seem to be a mediating variable. As is often the case with a cluster of significantly collinear variables, effects that appear strongly in simple bivariate analyses of a variable can disappear when that variable is considered as part of a multivariate model. For example, the choice of mall surveyed (Pruhonice versus Cerny Most, for example) affects trip distance decisively when considered alone, but this effect disappears when the mall investigated is considered in tandem with other variables.

The regressions reveal a strongly conservative component in trip-making: shopping mode, frequency, and presumably distance are as strongly (and independently) related to the values of these variables in prior (pre-hypermarket) shopping patterns as they are to current variables. Further work drawing on theories of travel and shopping choice-making is needed to tease out the interrelationships in this dataset and the directions of causation (when does mode of shopping determine trip distance, and when does the converse apply?).

Trip chaining. With over 80 percent of hypermarket trips starting from and returning home, it seems that the overwhelming portion of travel is specifically for the purpose of visiting the mall: that is to say, hypermarket travel can be seen as predominantly generated travel rather than included in or diverting existing trips.

Further work. Since mall locations, trip origins, and destinations were all located to the closest traffic analysis zone (TAZ), future work could use GIS techniques to add a spatial dimension to the predominantly statistical analysis reported here. GIS techniques could, for example, help narrow down *where* the greatest conversion of pedestrian shopping to car-based shopping occurred, or help segment trips according to the population density and transport accessibility of their origin TAZ.¹² In other words, spatial attributes may help explain more of the variance in trip parameters, especially travel mode.

A GIS-assisted distinction drawn between **long-distance** out-of-agglomeration origins, **suburban** origins (within the agglomeration, but from locations outside the densely built-up area and public transport services), **urban** origins (in dense areas well served by public transport), and **walking-distance** origins, might well be crucial in explaining trip characteristics, and also in guiding retail location policy. Retail must address the needs of consumers in each of these groups and mediate the conflicts that arise in seeking to serve them all. For example, the two malls at the termini of Prague's subway system (Cerny Most and Zlicin) may serve shoppers travelling outward by subway to shop as well as those who travel inward by car from surrounding villages and more remote locations. Shoppers at these malls can avoid travelling in the congested urban areas. If malls were better linked to the surrounding residential areas, they could also be visited by pedestrians and

cyclists for trips involving small loads. Shuttles could also be useful. As discussed elsewhere (Garb & Dybicz, 2006), the location of malls with respect to workplaces is also important: Warsaw has malls characterized by a sizeable portion of 'stop-on-the-way-home-from-work' trips; such characteristics are lacking in the Prague malls we examined.

Thus, the empirical findings presented here show not only the importance, but also the complexity of regulating the nature, location, and accessibility of retail. Although the current toolbox of retail regulation is fairly extensive, it may still need to be upgraded to accommodate this complexity.

During its first decade of expansion, Central European retail followed, by default, the North American model of relatively unfettered market-driven expansion.¹³ In USA, there are no national policies governing retail location and very few state-level initiatives as a result of the country's geographical size, lack of land-use powers at the federal level, and strong emphasis on local policy determination. The general trend in USA is one of local ordinances intended to temper the encroachment of new 'big box' stores. The circumstances and consequent actions vary from community to community; they tend to be reactive in the face of new proposed development rather than an overall strategy for retail policy as seen at a national level elsewhere.¹⁴

In Western Europe, on the other hand, a diverse and sophisticated toolkit of measures for regulating retail has evolved. Zoning has been used to restrict retail development to town centres or to urban areas with good access by all transport forms. In other cases, countries have set thresholds for the maximum size of new retail projects, the kinds of goods sold, and even the opening hours to reduce competition with small retailers. In the Dutch case, impacts on existing retail in smaller formats is avoided through specifying a small number of national 'large-scale concentrated retail establishments,' which have a *minimum* size threshold. Other tools regulate retail through the manipulation of incentive structures and stakeholder relations rather than zoning. Examples include redistributing to small businesses in traditional locations a portion of the business taxes paid by large retailers to retailers in out-of-town locations, or allowing a regional planning authority to veto the retail development proposals of another adjacent authority if these plans can be claimed to have an adverse regional effect. At various points in time, some countries have mandated obligatory retail research that maps out the needs for proposed retail development and its impact.

The empirical findings reported in this paper indicate the subtlety and contextual specificity with which these and other tools must be formulated and applied and the complex linkages with policies on motorization and other forms of deconcentration (of jobs and housing). In some respects, the environmental characteristics of malls can be improved by locating them on public transport routes in central locations: about a quarter of the trips can then come by transit and average travel distances could be almost halved (Garb & Dybicz, 2006). While offering no silver bullet, this step would support the rationale of policies intended to steer new retail development to accessible locations and would lead to significant improvement.

Nonetheless, the situation is complex. Hypermarkets significantly *reduce* the number of trips made, although they convert those remaining into motorized and longer-distance trips. We must also remember that such 'improved' urban accessibility would be irrelevant for the majority of trips, since more than 60 percent of the total distance travelled to the Prague hypermarkets came from or went to *outside* the Prague agglomeration. Whether the spread of large retail facilities to smaller cities, presumably closer to the homes of these non-Prague shoppers, lessens these long-distance trips to Prague hypermarkets remains to be seen.

As residential sprawl begins to develop around post-Communist cities, a trip to an out-of-town mall may replace a trip into the urban area as the environmentally-preferable mode of shopping for suburban residents.¹⁵ For them, a trip to central retail involves a longer travel distance on more congested urban roads. Even in a country like England, which has fairly ubiquitous modern retail provision, modelling shows that the provision of in-town location increases the *distance* travelled by shoppers coming from out of town. Moreover, they have to drive on congested urban roads rather than inter-urban highways (Hay, 2005).

The complexity of retail travel impacts and the need for a segmented approach to retail policy is apparent. We need to encourage commuters to chain their shopping trips; we must allow urban dwellers access to modern retail without having them travel out by car; we must allow suburban dwellers access to retail without driving into the city especially for this purpose. The location of hypermarkets at the extremities of transit lines (as is the case with Zlicin and Cerny Most, in the Prague survey) may be a good compromise between the sustainable support of city shoppers travelling out and suburban shoppers travelling in.

While the shaping of where, how, and how often people shop has a significant effect on their quality of life, we should consider whether the more substantial quality-of-life impacts of hypermarkets, especially out-of-town hypermarkets, might not lie in the travel and traffic generated. More significant, perhaps, might be the isolation of the retail function from other urban functions. Every euro spent in a hypermarket is a euro drawn from local neighbourhoods or downtown areas. Local and downtown shopping trips can be chained through walking to other town centre destinations. This chaining encourages a flow of revenue and people and generates opportunities for the activities, land-use functions, and social interactions that are vital for urban and neighbourhood spaces. The profit on a euro spent in a hypermarket typically returns to the West European corporation that owns the shops and the West European institutional investors who own and lease the mall. There is also the question of the consolidation of substantial segments of the market into larger companies, as enabled by mega-stores. The effects of such consolidation are felt all the way up the supply chain to the farmers, whose bargaining power diminishes in the face of the purchasing power of a Tesco, Walmart or a Carrefour.

Thus, in addition to the effect studied in this chapter (added car travel), there are deeper quality-of-life issues at stake when a family shifts from shopping twice a week at the local grocery to a monthly car-borne trip to a hypermarket.

Notes

¹ The author conducted this research in his capacity as Director of European Programs with the Institute for Transport and Development Policy (ITDP; see www.itdp.org). This project was sponsored by a Rockefeller Brothers Fund grant to ITDP. I am grateful to Jirina Jackson, Tomek Dybicz and Gregory Newmark for their role in preparing and administering the questionnaire, to the UDI (Prague) for data entry and use of their excellent services in providing TAZ-to-TAZ network distance matrices, to Tomasz Dybicz whose prior work in Warsaw provided a useful reference point, and for his assistance in calculating trip distances for Prague; to Shaul Zionit who introduced me to the joys of using JMP(SAS) for data analysis; and to the editors of this volume for their useful comments and for urging a formal multivariate model in preference to a more piecemeal bivariate approach.

² For a far more detailed account of the three stages of the Central European retail revolution, see Dries, Reardon, & Swinnen (2004).

³ For an overview of the impact of socialism on urban spatial structures, see Bertaud (2006).

⁴ I know of no single good overview of the spatial organization of retail in Central Europe during the Socialist period, but Elmar Kulke provides an excellent review of the East German situation (Kulke, 1997).

⁵ Number of hypermarkets drawn from INCOMA consultancy Shopping Center statistics. Motorization rates are drawn from UDI (Prague) *Yearbook of Transportation*—2004, Prague: UDI, 2004. Motorization rates for Prague, also given in this handbook, would be about 100 cars per thousand higher than the national average.

⁶ This table is derived from information in Newmark, Plaut & Garb (2004), and from a table of Prague hypermarket descriptions prepared by UDI (Prague).

⁷ Careful visitation counts by car and shuttle were carried out for one of the malls: Shopping Park Praha. The survey was conducted by M. M. Agentura (Prague) in December of 2000. The total number of visits for the 24 hours on a weekday was 18,336 and 33,433 for the weekend. Our surveys thus represent 1.0% and 0.7% of these numbers respectively.

⁸ Each of these three trip parameters (distance, mode, frequency) is statistically related to the other two as well as to a variety of other variables, in themselves related; with these obvious colinearities the direction of causation is sometimes open to different interpretations.

⁹ All calculations for distance exclude trips from outside the agglomeration, since these are assigned by the traffic model to entry points at the edge of the agglomeration. The distribution of distance is mildly non-normal, and a slight improvement in the regressions (significances, R^2 , normality of residuals) can be obtained through the use of the square root of distance rather than distance itself. These gains, however, do not invalidate any of the interpretations made and so do not seem sufficient to merit the use of a less intuitive measure and unit (square root of distance).

¹⁰ These were collected by M. M. Agentura (Prague) in Dec. 2000.

¹¹ Bennisson, D., J. Byrom, et al.. (2000). *Linked Shopping Trips: a Report for Tesco Stores Ltd.*, Department of Retailing and Marketing, Manchester Metropolitan University as cited in Oxford Institute of Retail Management (2004). NRPf Scoping Paper: *Linked Trips and the Viability and Vitality of Centers of Retail Activity*, Templeton College, University of Oxford. These reports stem from the fact that the issue of how shopping figures into linked trips (or ‘complex trips,’ combined trips, or ‘joint purpose trips’ as they are also called) has assumed importance in the UK, as part of the debate on how out-of-town and town-edge stores effect the vitality of town stores. There is concern to use make sure that new large stores will remain accessible enough to city centres so that trips to them will link to the adjacent city centre.

¹² The beginning of such work was presented as part of: Yaakov Garb and David Epstein, *Rapid Retail Deconcentration in Post-Communist Prague: Causes and Travel Consequences*, a presentation to the conference Spatial Deconcentration of Economic Land Use and Quality of Life in European Metropolitan Areas, Jerusalem Nov 20-22, 2005, and subsequent work on this dataset at the University of Michigan by David Epstein.

¹³ See, for example, Walter (2003) for a detailed study of retail regulation in the Polish context, which shows that while existing legal tools were adequate, their lack of enforcement led to a more-or-less free

market development context. The drive toward retail modernization overrode any concerns of spatial consequences. Impact analysis of new retail facilities was required, but these were prepared by the developer and there were no guidelines as to what to measure, or what the goals or benchmarks were. As might be expected, such reports focused on (unsubstantiated) claims about increased employment opportunities and highly local (parking-lot level!) assessment of impacts on air quality.

¹⁴ This summary and the following summary of West European retail is derived from a comprehensive survey of the topic by Y. Garb and S. Lichfield, forthcoming from ITDP.

¹⁵ See the discussion of the Centrum Janki mall outside Warsaw in Garb & Dybicz (2005) and Garb & Dybicz (2006).

References

- Adiv A (1983) The structure of the work trip based on analysis of trip diaries in the San Francisco Bay Area. In: Carpenter S, Jones P (eds) *Recent advances in travel demand analysis*. Gower, Aldershot, England, pp 117–136
- Bertaud A (2006) The spatial structures of central and eastern European cities: more European than socialist? In: Tsenkova S, Nedovic-Budic Z (eds) *The urban mosaic of post-socialist eastern Europe*. Springer, New York, p. 91
- Dragomir M (2001) Consumers' hypermarket mania driving 3-year retail expansion. *Prague Business Journal*, August 6–12
- Dries L, Reardon T, Swinnen J (2004) The rapid rise of supermarkets in central and eastern Europe: implications for the agrifood sector and rural development. *Development Policy Review* 22(5):525–556
- Garb Y, Dybicz T (2000) A preliminary estimate of traffic generation in Warsaw malls and the CO2 reduction potential of improved retail siting. Unpublished memo prepared for the Institute for Transportation and Development Policy
- Garb Y, Dybicz T (2005) Global lessons from the travel impacts of retail decentralization in Central Europe. Paper presented at the Annual Meetings of the American Planning Association, March 2005
- Garb Y, Dybicz T (2006) The retail revolution in post-socialist Central Europe and Its lessons. In: Tsenkova S, Nedovic-Budic Z (eds) *The urban mosaic of post-socialist eastern Europe*. Springer, New York, p. 231
- Garb Y, Jackson J (2006) Central Europe's brownfields: catalyzing a planning response in the Czech Republic. In: Altrock U, Güntner S, Huning S, Peters D (eds) *Spatial planning and urban development in the new EU member states*. Ashgate, Aldershot
- Hay A (2005) The transport implications of planning policy guidance on the location of superstores in England and Wales: simulations and case study. *Journal of Transport Geography* 13:13–22
- Jackson J, Garb Y (2002) The search for brownfield beadership in central European cities: overview and case study of the Czech Republic. Policy report. Institute for Transportation and Development Policy, New York/Prague
- Kulke E (1997) Effects of the economic transformation process on the structure and locations of retailing in East Germany. *Journal of Retailing and Consumer Services* 4:49–55
- McGuckin N, Murakami E (n.d.) Examining trip-chaining behavior: a comparison of travel by men and women. Manuscript
- Michalak WZ (2001) Retail in Poland: an assessment of changing market and foreign investment conditions. *Canadian Journal of Regional Science* 243:485–504

- Newmark GL, Plaut PO, Garb YJ (2004) Shopping travel behaviors in an era of rapid economic transition: evidence from newly built malls in Prague, Czech Republic. *Transportation Research Record* 1898:165–174
- Oxford Institute of Retail Management (2004) NRPF scoping paper: linked trips and the viability and vitality of centers of retail activity. University of Oxford, Templeton College
- PMR Publications (2004) News item in the Central Europe Retail Headlines Newsletter accessed at <http://www.pmrpublications.com/> but no longer available without charge
- Walter M (2003) Einzelhandelsentwicklung in Polen: Probleme der planerischen Steuerung des Einzelhandels in Warschau. Masters thesis. Institute for Town and Regional Planning. Berlin Technical University