

Urban form and trends in shopping journeys: Empirical evidence from the Netherlands.

Orit Rotem-Mindali

OTB Research Institute for Housing, Urban and Mobility studies
Delft University of Technology, *email.o.c.rotem@tudelft.nl*
Phone +31(0)15-2785030 fax +31-(0)15-2783450

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Abstract

The 20th century is characterized by fundamental changes in personal mobility and consequently in aspects such as technology, economy and lifestyle. Shopping, an inseparable element of personal activities, have gone through significant transformations.

On the Supply side, retailing has evolved in two aspects: spatial location and organizational structure. Movement from city center into the outlying area is an example of modification in spatial location of retailing. Changes such as growing store size, planned centers and store chains, demonstrate organizational modifications. These changes, together with changes in the demand side of retailing, such as a rise in consumption levels, associated with changes in lifestyle preferences and socio-economic attributes, have generated a continuous dynamic retail environment.

This research aims to identify some of the changes over time in consumers' shopping behavior in the Netherlands, by using The Dutch national travel survey (NTS) database from 1993-2005. The data enables to identify shopping frequency, shopping time and travel time. Furthermore, it can be used to analyze how shopping is organized over the day. And may used to answer questions such as what travel mode is used. These changes will be related to other trends, such as the rise of car ownership, and women participation in the work force.

Introduction

Researchers have labelled today's society as being in the '*consumption era*' or '*consumption culture*' and addressed the modern society as the '*consumer society*' (Baudrillard 1998; Miles 1998; Lee 2000; Slater 2000; Clarke 2003; Goss 2004; Zukin and Maguire 2004), where consumer goods and services are not merely created, bought, accumulated and used (McCracken 1988; Campbell 1994), but are a means of communication (like a language), a system of ideological values, a social function. This type of definition reflects on the growing importance of shopping activity within households' activity patterns. Shopping gradually take an important role in the everyday life. With the increase of personal mobility investigations are needed that qualify the importance of shopping-related trips.

Retail systems, as an inseparable element of personal activities, have gone through significant structural transformations. On the supply side, retailing has evolved in two aspects: spatial location and organizational structure, both depending on national legislations and policies. On the demand side, consumer behaviour changed considerably, with the general tendency of increasing importance of shopping over the past decades.

It can be expected that, due to many developments, shopping behaviour changed. Such developments may be in households (such as increase of women in the workforce, increase of car ownership, etc.), spatial trends (sprawl, network city developments (Hajer and Zonneveld 2000)), and policy changes (relaxation of retail location policies; relaxation of opening hours), ICT, and so forth.

Although there is much attention to the role of housing and employment in the network society, less attention is devoted to other activities and services, including shopping. Shopping is a substantial part of weekly activity behaviour for every household. It is expected that shopping behaviour is closely related to urban structure (Handy 1993).

This study aims to identify the most important changes in consumers' shopping behaviour over time in relation to the urban environment, and to trace back the influence of urban environments and personal mobility on shopping behaviour. One would expect that such studies already exist, and indeed, such studies exist in a qualitative way, however, quantitative, longitudinal overviews of shopping demand are lacking. There is hardly any analysis of spatial shopping behaviour over time, since all studies are cross-sectional studies.

This paper will present a brief literature review on the retail system and accessibility, changes in locational patterns. Using the Dutch National Travel Survey NTS (OVG het Onderzoek Verplaatsingsgedrag) the paper will describe shopping trends in the Netherlands (1993-2006) and will analyze the influence of spatial structure of the urban form on shopping trips. The analysis will explore the changes in activities within and outside home municipality, modal split, distances travel, trip duration and departure time. This will be preformed by descriptive analysis and by using regression and logit models to understand the role of the built environment. The paper concludes with a discussion on the factors affecting consumers' behaviour.

Literature review

This research aims to point on spatial consequences of changes in households' consumption patterns; therefore it is important to understand the context of the geographical dispersion of retail. Factors affecting retail dispersion range from social to technological and to institutional aspects (Mulhern, 1997). For example, social changes are expressed in the dispersion of retail following population decentralization (Hughes, 1974, Kim et al., 2005).

The retail system

Retailing is defined as the activities incidental to selling products to ultimate consumers. Retail activities have seen remarkable changes since the ancient market convening in the city square. Organizational structure, technology and a variety of other external social, economic and locational changes have had their impacts on the daily and less frequent interactions between consumers and retailers. Early studies have considered retail as a local market activity and retail theory has evolved with a local market perspective (Severin et al., 2001). Normative spatial models such as Christaller's (Christaller, 1933) central place theory or spatial interaction theory, have generally focused on local market levels (Shepherd and Thomas, 1980).

The present day *retail market* can be described by four key elements: location, income, demographics and lifestyle. A market is contained within different geographical scales ranging from a neighborhood level to metropolitan, national and global scales. The level of population income and income distribution define the market size. The socio-demographic attributes of market segments, such as age and gender, different lifestyles resulting from ethnic identity, environmentally conscious communities etc. create sub-markets with various preferences (Jones and Simmons, 1990). For the last few years we have been witnessing a continuous growth of the retail market. This growth is much attributed to higher income per households, due to economic improvements and higher women participation in the labor market, a rise in demand for larger diversity and lower prices of products.

Accessibility and changes in the locational patterns

The locational patterns of retail facilities have always conformed to accessibility considerations. This was the case with town center and neighborhood street corner stores, and this was the case with strip development along highways when automobile-dependent suburbanization emerged in North America. The advent of expressways or freeways, also called Limited Access Highways, gave rise to the development of large shopping centers with huge malls at highly accessible network nodes, substituting for strip development. In the North American case, accessibility has become synonymous with car availability.

The private car is a main factor contributing to accessibility changes in metropolitan areas. The private car reduces travel time to destinations and increases the freedom of choosing when and where to travel.

A main impetus for the development of shopping centers has been the geographic shift of the population from cities to suburbs (Mulhern, 1997), much as a result of increasing real estate rents in the inner cities. The population shift to suburbs established new potential markets, which facilitates the support of new planned shopping centers. A major force for location shifts of shopping centers in the Netherlands is attributed to the formation of urban polycentric developments, which result in imperative changes of the entire household activity patterns.

In general, the ideas behind polycentric urban developments or network cities and changing activity patterns are a result of the dynamics of urban regions. The network city is a complex concept, which refers to polycentric and sub-center developments (Hajer and Zonneveld, 2000, Meijers and Hoppenbrouwer, 2001, Dieleman and Faludi,

1998), to be seen in both urban structures and underlying activity patterns. Activity patterns are a broader concept, explaining household's and individual's spatial behaviour and their derived travel (Maat et al., 2005). The dynamics of the urban regions can be characterized as the transformation from the monocentric city to the polycentric urban region. Two intertwining processes are often highlighted to typify the transformation to this new urban configuration. The first one is the development of new forms of clustering of economic activities and employment (in particular office employment and high-range consumer services) in new sub-centers across city-regions rather than merely in cities (Schwanen et al., 2004).

The second process that appears essential in the polycentric urban model is the emergence of new spatial activity patterns and their derived from of travel. Parallel to the dispersal of employment and services over a larger variety of sub-centers, suburbanization tends to accelerate and people's action space have widened due to the vast expansion of the automobile system (Anas et al., 1998, Schwanen et al., 2003, Buliung and Kanaroglou, 2006). The spatial bonds of home with places of work, shopping and leisure and entertainment activities have become increasingly loose. Primarily car-born action spaces connect more different types of residential places with more different clusters of work and other daily and non-daily activities. The strong orientation of action spaces on the most nearby city center has been replaced with more polycentric 'criss-cross patterns' over urban regions in which this city center is just one of the node similar to other suburban location or other suburban municipalities (Schwanen et al., 2003).

The Dutch National survey

This paper will provide longitudinal research of Dutch shopping behaviour 1993-2005. Because there are hardly shopping data over this period, the data will be derived from travel data, which includes 'shopping' as a purpose. This source is the Dutch National Travel Survey NTS (OVG het Onderzoek VerplaatsinGsgedrag). The Dutch NTS is a cross-sectional travel diary survey of household travel behaviour. The survey provides information on approximately 600,000 trips made by about 150,000 individuals each year. Each respondent complete a trip diary for one day and is asked to provide information on personal and household attributes. For each reported trip the respondents are asked to state the purpose of trip, mode of transport used, distance, origin and destination and starting and ending time (Van Evert and Moritz, 2000, Schwanen et al., 2001, Susilo O. Yusak and Maat, 2007). Over the years the NTS has been improved continuously. For example, during the period 1993-2005 (the analysis period of this paper) the NTS has been modified twice: in 1999 and in 2004. This may have some influence on the consistency of the reported results (Van Evert and Moritz, 2000, Susilo O. Yusak and Maat, 2007). Nevertheless, the assumption of this paper is that the difference results are comparable.

The data enables to identify shopping frequency, shopping time and travel time. Furthermore, it can be used to analyze how shopping is organized over the day. And may used to answer questions such as what travel mode is used. These changes will be related to other trends, such as the rise of car ownership, and women participation in the work force. Moreover, later on be related to retail policies, such as 'peripheral retail policies' and its relaxation and policies on opening hours.

Analysis results

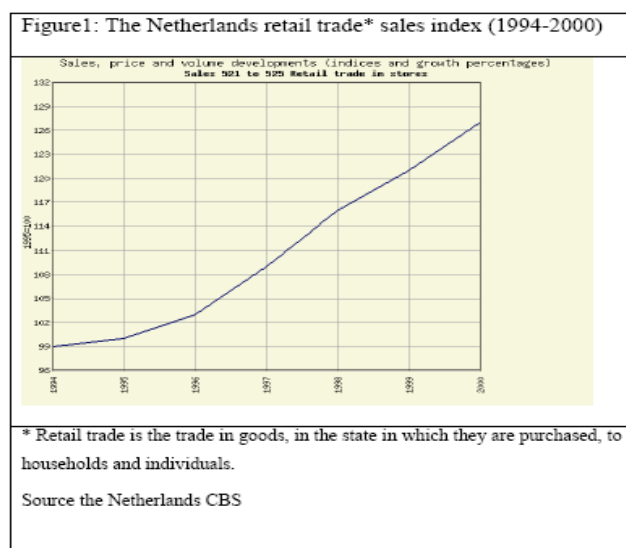
The literature describing shopping behaviour and related travel in the Netherlands is very limited. Mostly one can find some information on trends in retail sales, but this is also limited in years. Figure 1 demonstrates the

trends line in retail sales between the years 1994-2000. This figure indicates on a sales growth rate of 25% for the period discussed.

Yet the proportion of the number of shopping trips is slightly decreasing over the years. From the trip purpose split demonstrate in Figure 2 one can notice that trip purposes proportion do not change much except from the small decrease in shopping and a minor increase in number of leisure activities. It is important say that there might leisure purposes and shopping activities may be mixed, since shopping may be perceived also as a leisure activity.

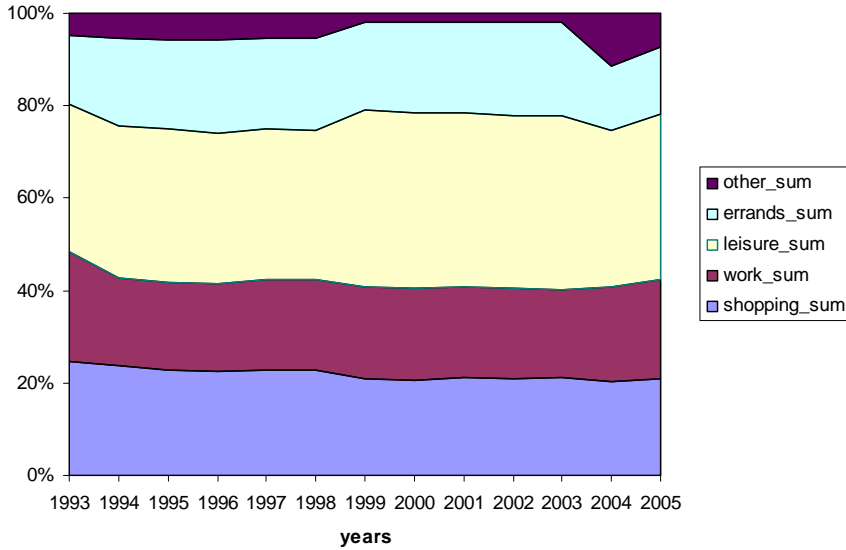
Figure 3 and figure 4 present mean travel distances per person and mean trip duration per person in order to further understand the travel behavior of shopping-related trips. Figure 3 shows that the mean travel distance for shopping purposes has not changed significantly for the years 1993-2005 (remains roughly 5 kilometers per trip). This receives further support when comparing to the mean distance traveled for work purposes which have increased significantly from approximately 15 kilometers per person per trip to approximately 21 kilometers in 2005.

Adding to these results, it has been calculated that the average proportion of number of shopping trips outside the home municipality is 19.7% in comparison to work related trips 52.1% for the years discussed.



While for number shopping trips this proportion has not been significantly changed over the years, for number of work trip the average proportion of trips outside home municipality have increased from 48.2% (1993) to 56.3% (2005). Figure 4 demonstrate similar results for the changes in average travel distance when differentiating between travel within Home (H) municipality and travel outside home municipality for work and shopping purposes. For shopping Purposes travel distance has not changed significantly both for within and outside home municipality while average travel distance have raised significantly for work purposes both within (from 4.0-5.6 km) and outside (26.5-32.6 km) home municipality for the years 1993-2005

Fig. 2: Mean travel split



These results indicate on the possible preference of the population accept longer commuting trips, but for shopping purposes ‘near by’ shopping locations are favored. In contrast to the literature, this result raises the hypothesis that travel activity patterns for shopping purposes are not similar to the “criss cross” travel pattern of employment purposes, and that the distance traveled remains relatively low.

Fig. 3: Mean travel distance per person

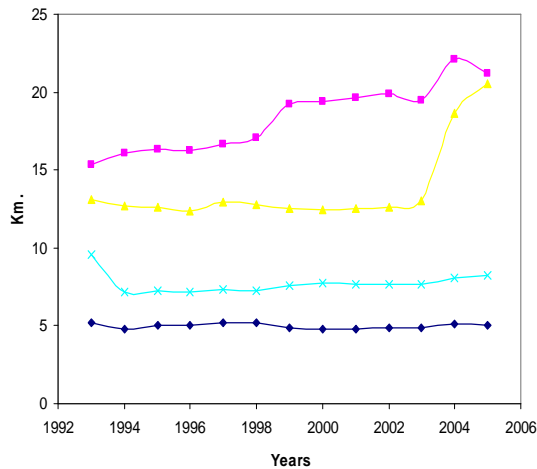


Fig. 4: Change in travel distance (Index 1993=100)

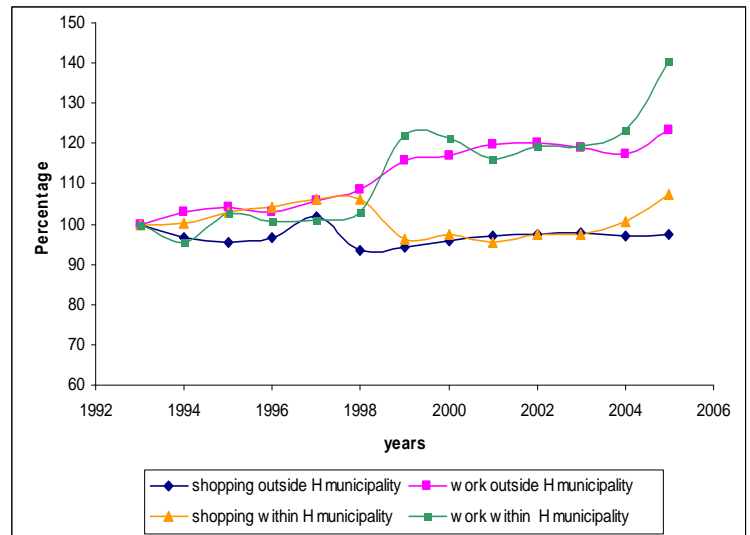


Figure 5: Travel distance within and outside home municipality

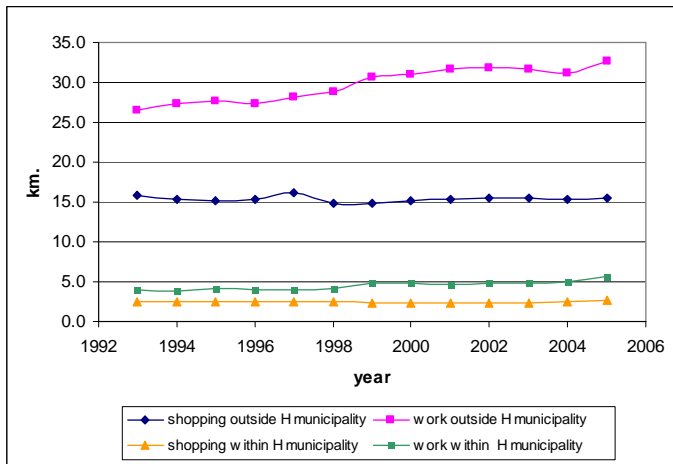


Figure 6: Average trip duration per person

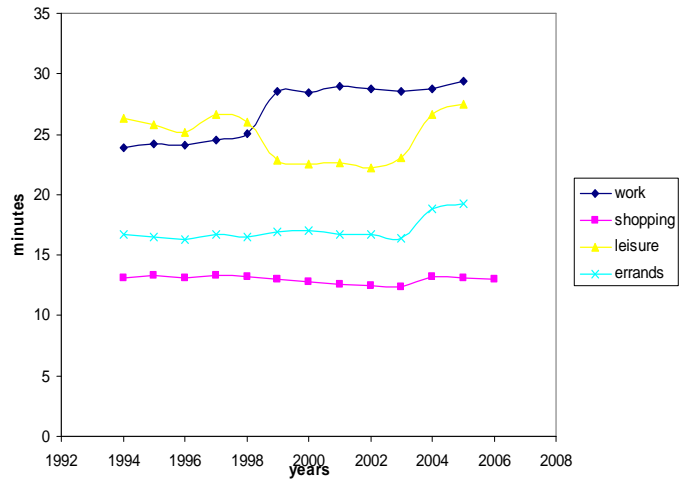


Figure 5 describes the travel distance within and outside home municipality. It is shown that distances traveled for work outside home municipality are much longer than those for shopping purposes. While for work distances reach 30 km, for shopping activities distances reach 15 km in 2005.

Figure 6 illustrates the trend line of mean trip duration per person. Trip duration includes only the time to reach the activity and it does not include the duration of the activity itself. As can be seen in Figure 6 there is a minor decrease in shopping related trip duration. In comparison, work purpose related duration reveals a trend of increase trip duration (the change in 1999 concerns a change in methods of collecting the data). This may be supported by the growing use of the private car as can be seen in Figure 7.

Figure 6: Average trip duration per person

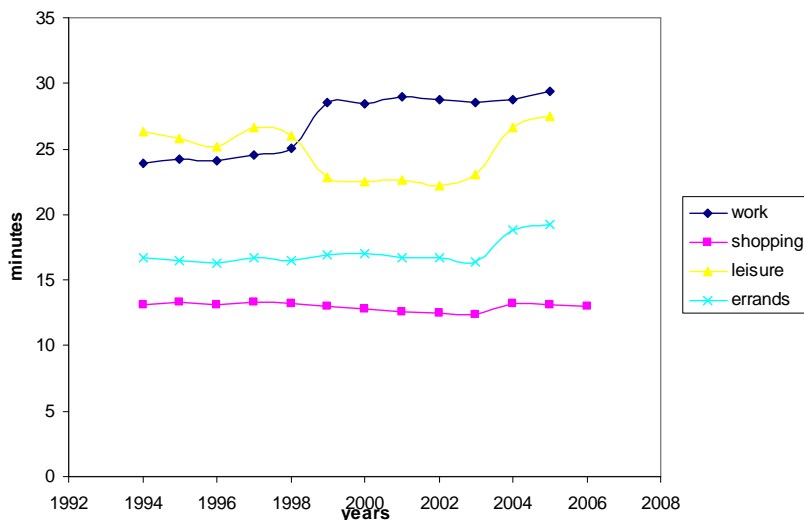


Figure 7 illustrates the modal split for the activity of shopping. It is interesting to see that from 1993-2001 non-motorized transportation has had the highest proportion of use for shopping. But it shows an ongoing decrease. In 2001 the proportion of private car use for shopping has exceeded the alternative of non-motorized

transportation. Figure 8 and Figure 9 attempt to explain the change by differentiating according to gender. While male modal split (Figure 8) shows a rather stagnant trend in which each mode maintain a more or less same proportion. For female modal split (Figure 9) demonstrate a continues trend of reduced use of non-motorized transportation and at the same time an increase in use of the private car for shopping purposes. The raise in women use of private car corresponds with the increase in car ownership level, especially the increase of households with more than one car. In 1993 only 18% of households had more than one car, and by 2005 25% of the households had more than one car. In this same period women use of private car for shopping purposes have increase in 11.5%. this may suggest that raise in car ownership have affected the use of car by woman, but there should be more reasons for this change in modal split. One of the possible explanations could be the higher proportion of woman participating in work force (Figure 10). This may explain more time constraints that affect mode choice.

Figure 7: Modal split

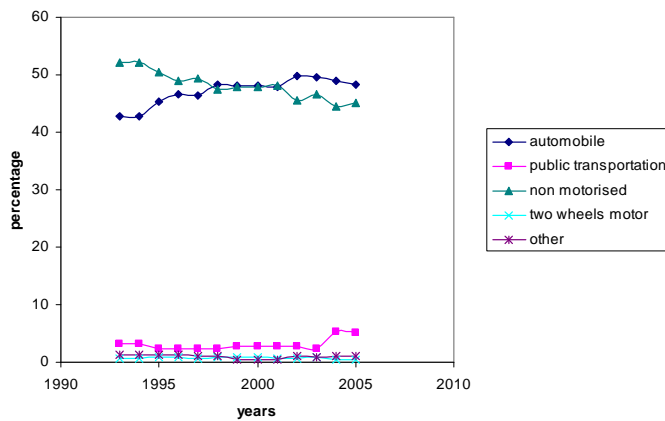


Figure 8: Modal split by gender (male)

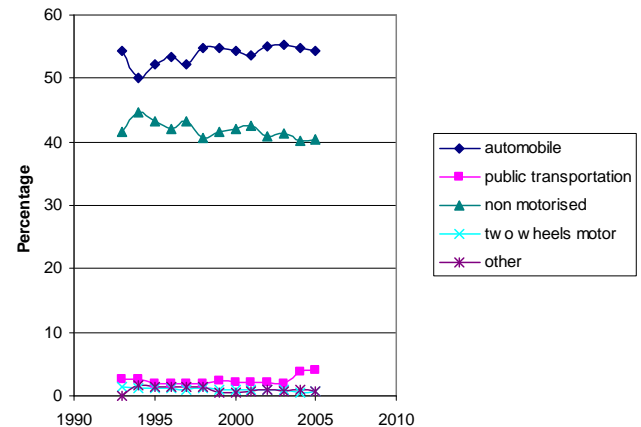


Figure 9: Modal split by gender (Female)

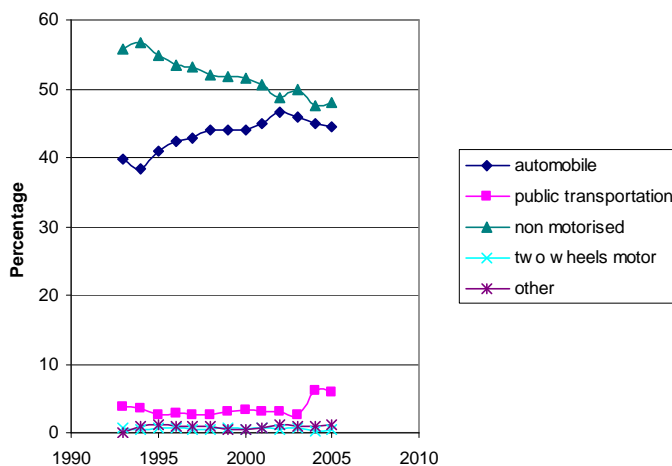
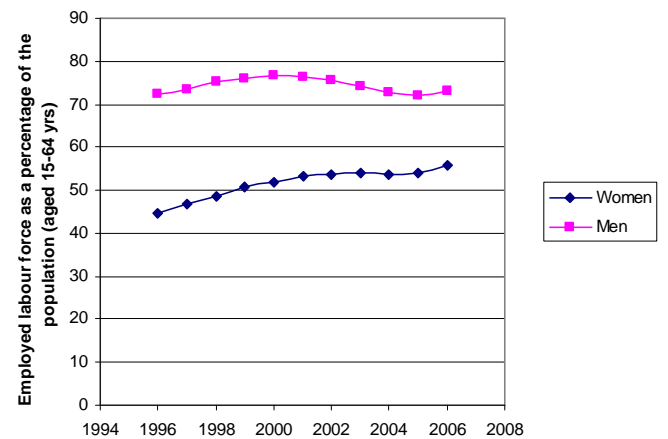


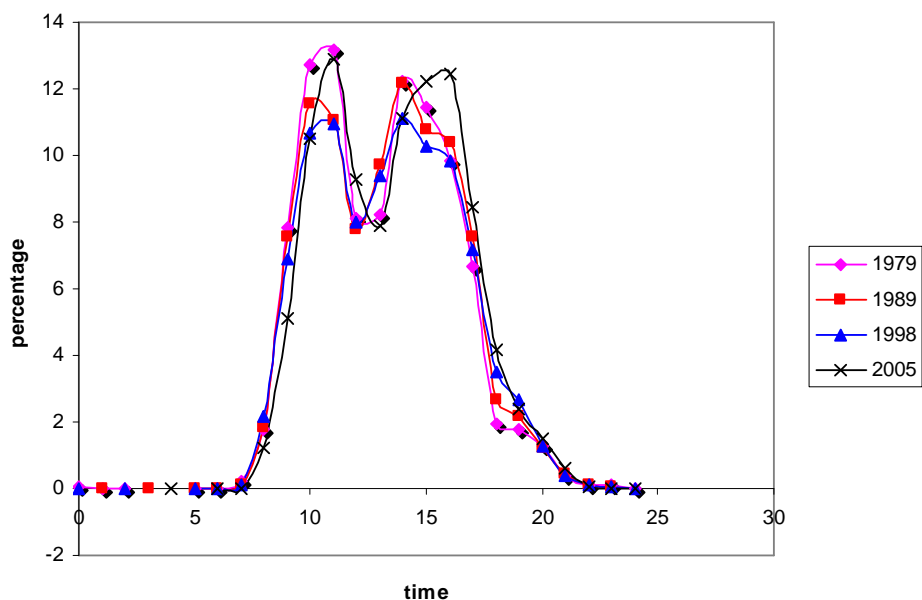
Figure 10: Net labour participation



As discussed earlier in the paper, one of the of the changes employed in the dutch retail market is the relaxation of opening hours, which occurred in the Netherlands in 1996 (Hamermesh and Pfann, 2005). Figure 11 attempts

to demonstrate shopping behaviour before and after this change. Figure 11 demonstrate trip departure hour for different years before and after 1995. The results suggest that on average people do not change significantly the timing of their shopping activity. This is true for both before and after 1995 which demonstrate similar patterns. Yet in 2005 a change in trip departure time is notable. The second peak hour for shopping departure time occurs later than in previous years. It is important to point that Figure 11 is examining the average trip departure time and it is possible that when a non aggregate analysis is applied the results may be different. For example, workers who previously had work schedule constraints that interfered with the shopping opportunities may find that the relaxation of opening hours enables to shift towards unavailable times.

Figure 11: Trip departure time



Urban form and trends in shopping journeys

This section will describe the result for the modelling attempts that were conducted in order to understand how urban form influences the patterns of shopping journeys. The data used for this purpose is based on the Dutch national survey and complementary land use data which will express the urban form attributes such as level of urban density, retail density, part of a polycentric region, population size per municipality etc. the variables used for the modelling purpose are shown in table 1.

Each of the models is calculated for three years: 1995, 2000 and 2005. This is preformed in order to obtain an understanding on the changes over the time. It is important to stress once more on the fact the Dutch national survey had several modification in definitions of variables. Therefore, it may partly influence the comparison ability over the years.

Table 1: Description of variables:

Variable name	Description
Male	Dummy variable for male individuals
Age <25	Dummy variable for people younger than 25 years of age
Age 25-39	Dummy variable for people the ages of 25-39 years
Age 40-64	Dummy variable for people the ages of 40-64 years
Age 65 and older	Dummy variable for people 65 years of age or older
Dependent child in HH	The existence of children younger than 12 years of age
Household size	Number of household members
Personal net income	Personal income after taxes per year
Higher education	The individual has a university or polytechnic degree
Employment status	Type of employment
Automobile availability	The individual has a driving license and at least one automobile in the Household
Population of home municipality	Number of inhabitants in Individual's home municipality
VERYHIGH urbanized	Home municipality has ≥ 2500 addresses per km ²
Highly urbanized	Home municipality has 1500- < 2500 addresses per km ²
Medium urbanized	Home municipality has 1000- < 1500 addresses per km ²
Low urbanized	Home municipality has 500- < 1000 addresses per km ²
Non urbanized	Home municipality has < 500 addresses per km ²
Rand	Home municipality is located within the Randstad metropolitan area
Maincity	Home municipality is one of RMA's main cities (Amsterdam, Rotterdam, Den Haag or Utrecht)
Retail Density	Number of retail companies per municipality
USEAUTOM	Main mode of transportation used is automobile
USEPUBLIC	Main mode of transportation used is train/bus/metro
USENONMO	Main mode of transportation used is non-motorized modes (walking/cycling)
USEOTHER	Main mode of transportation used is other modes (

What is the travel distance for shopping purposes?

This section focusing on the question what is the travel distance for shopping purposes and how do urban form attributes affect the distance travelled? Table 2 attempts to answer this question it show the results of a regression model

The variables constructing this model can be divided into three groups: SED (Socio-economic-demographic) variables, and urban form variables and mobility variables. Table 2 shows that male tend to travel longer distances than female shoppers and this effect is significant and similar throughout the years. The same trend can be viewed also for employment status. A full time worker tends to travel longer distances. Consumers with dependent children tend to travel less than those without dependent children, yet the over the years the difference between consumers travelling with or without dependent children decreases. This may be attributed to the growing use of the private car. The private car may offer an easy way of performing shopping activities with more passengers, in particular, those who are less mobile (i.e. children). This will be further discussed in following sections.

Table 2: Regression model for shopping travel distance (hectometres)

Term	1995		2000		2005	
	Estimate	t Ratio	Estimate	t Ratio	Estimate	t Ratio
Intercept	35.49	6.88	53.27	8.06	31.79	18.08
Male	1.48	2.11	1.27	2.00	1.80	3.43
Higher education degree					3.97	8.67
Employment status	1.38	1.65			1.80	2.75
Personal net income	0.87	2.67	0.52	2.14		
Household size	1.25	1.64	-2.02	-3.90		
Automobile availability	-2.64	-1.54	3.15	1.97	-5.17	-3.95
Retail density	0.00	-1.98				
RAND[1-0]			-1.55	-2.29		
MAINCITY[1-0]			1.68	1.48		
AGE 25-39	-8.22	-3.66	-6.63	-2.77	-8.14	-4.79
AGE 40-64	-5.88	-2.78	-6.84	-3.02	-6.23	-4.83
AGE 65 and older	-9.98	-3.57	-10.48	-4.03		
Dependent children	-8.74	-4.28	-7.43	-2.90		
LOW urbanized	-8.39	-4.32	-8.12	-3.91	-7.78	-4.78
MEDIUM urbanized	-9.29	-4.73	-10.25	-5.00	-15.30	-9.35
HIGH urbanized	-12.61	-6.37	-15.69	-7.91	-17.93	-11.35
VERYHIGH urbanized	-18.18	-8.05	-22.08	-9.71	-17.14	-9.07
USEAUTOM	49.48	10.70	34.21	5.75	54.75	52.48
USEPUBLI	155.59	26.02	123.63	18.19	133.71	38.89
USENONMO	-8.09	-1.77	-19.00	-3.22		
Population accessibility	0.00	1.84				
Observations (N)	21097		22446		43987	
Mean of Response	46.827		46.190		53.23066	
R ²	0.143		0.127		0.091	
Adjusted R ²	0.142		0.126		0.091	
F Ratio	194.9801		191.3321		367.6304	
DF	18		17		12	

It is interesting to view the effect of urban density on distance travelled. Table 2 shows that when an urban area is characterized by a high density, shopping travel distances tend to be shorter than those urban area less dense. This is expected since the opportunity of performing activities in general and shopping activities in particular are larger. Activities are located closer since the urban area is more concentrated..

Another important finding is that Retail density is not significant in this model. Since retail density is not significant it hints on the spatial perception of the consumers. Potential locations of shopping may be preferred not according on them being located in close proximity, but on other factors, specifically, mobility and accessibility related factors.

Table 2 also demonstrate that the use of a private car increases the distance travelled for shopping. The use of public transportation increases even more the distance travelled. This may be explained that the use of public transportation is for travelling to location outside home municipality (will be discussed in following section), and as shown in Figure 8, it is rarely used. One constraint effect on consumers is represented here by the variable dependent children in the household. As it is demonstrated here the effect of shorter travel distance reduces over time and in 2005 it is not significant. The explanation for that may be the growing use of the private car and the rise in car ownership.

Where do people shop?

Previous section has discussed the changed over the years of shopping within and outside home municipality. this section will try to answer who will most probably shop within home municipality and who will shop outside home municipality? As described earlier the proportion of shopping trips outside home municipality are only 19.7% from total shopping trips. In figure 4 and figure 5 it is shown that there is hardly no changes in the distance travelled over time, both within and outside home municipality this may represents a conservative preference of consumers for shopping locations, despite of more shopping opportunities in accessible locations. Table 3 shows the results for a binary logit model used for estimating the tendency to shop within or outside home municipality.

Table 3: Shopping within home municipality

	1995		2000		2005	
	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
Intercept[1]	1.34	19.67	0.45	4.60	1.20	9.97
Male			-0.06	-5.38		
Personal net Income	-0.03	-8.67	-0.01	-3.33	-0.05	-6.74
Household size	-0.03	-3.50	0.04	4.52		
Employment status	-0.02	-2.45				
Automobile availability	0.12	4.99				
USEAUTOM	-1.46	-23.25	-0.79	-9.01	-1.27	-10.92
USEPUBLI	-2.22	-30.87	-1.34	-13.63	-1.95	-14.66
USENONMO	0.84	13.09	1.36	15.10	0.56	4.71
AGE 25-39	0.25	9.03	0.35	10.13	0.42	8.63
AGE 40-64	0.06	2.49	0.28	8.67	0.37	8.50
AGE 65 and older	0.20	5.61	0.49	11.76	0.53	10.81
Dependent children in HH	0.26	10.54	0.23	5.11		
LOW Urbanized	0.44	21.12	0.40	13.55	0.44	11.74
MEDIUM Urbanized	0.93	41.89	0.84	27.25	0.70	17.92
HIGH Urbanized	1.14	47.89	1.14	37.26	1.14	28.67
VERYHIGH Urbanized	1.33	45.17	1.24	31.54	0.97	19.34
Number of observation (N)	138818		77500		43987	
DF	15		14		13	
ChiSquare	15450.11		8040.701		1477.431	
L(β)	-47978.697		-27637.809		-18220.346	
L(0)	-55703.754		-31658.159		-18959.061	

Mobility factors in the model show that shopping within home municipality is most probable to occur when using non-motorised modes of transport. While the use of the private car and public transportation raises the propensity of shopping outside home municipality. This reinforces the hypothesis discussed in previous section regarding the relationship between urban density and distance travelled for shopping.

The direction of influence of density of urban area on shopping within home municipality is positive, but for higher densities it decreases it shows decreases over the years. It is important to point on retail density that was not found as a significant factor to influence the propensity of shopping within home municipality. This emphasizes again the potential effect of mobility factors to overcome the spatial scattering of opportunities. Other spatial elements that were found not significant are the municipality being located in the randstad or being one of the main cities in the randstad. This signifies the non-significant effect of the polycentric region on shopping within or outside home municipality.

The influences of socio-economic factors on the tendency to shop within home municipality are similar to the results for shopping distance. Although the difficulty of shopping when there are dependent children in the

households is evident, since we see that the tendency to purchase within home municipality is higher with dependent children.

What mode of transport is preferred by consumers for shopping?

After discussing the location of shopping and the distance travelled for shopping purposes, this section will examine what mode of transport is preferred for conducting shopping activities and who tend to prefer each mode. Table 4 will show the results of Multinomial logit model that was performed to understand the choice of mode of transport. The base alternative for this model is the non-motorized mode of transport.

Similar to the literature, the modelling effort show that automobile availability raises the propensity of using the private car for shopping purposes. For those individuals with automobile availability may also prefer non-motorized modes of transport over public transport. This may be a result of poor familiarity with public transport.

Table 4: Choice of mode of transport for shopping purposes.

Term	1995				2000				2005			
	Automobile		Public transport		Automobile		Public transport		Automobile		Public transport	
	Estimate	t statistic	Estimate	t statistic	Estimate	t statistic	Estimate	t statistic	Estimate	t statistic	Estimate	t statistic
Intercept	-3.5416799	-12.2923736	1.8797262	19.457856	-2.6867221	-21.661774	2.0120324	42.10462	-2.1874866	-17.7641586	2.0335476	33.565253
GESLACHT[1]	0.7546477	7.14282168	0.3293638	8.515974	0.5203564	9.6260525	0.2641888	13.531352	-0.2663857	-9.9601683	-0.0892769	-8.7718683
INKP	-0.054107	-2.13158154	-0.026224	-2.8136131	0.0204134	2.1978015	-0.0011443	-0.3067337	0.0255833	1.72754114	-0.0381405	-5.2310319
HGROOT	-0.0827593	-1.40620078	-0.105371	-5.0462138					-0.0729612	-9.3762385		
EMPLYMENT	-0.1622582	-2.6469018	-0.3037904	-13.237216	-0.1559803	-8.8994992			-0.1791066	-7.3809651		
AFSTAND	0.003059	12.9398477	-0.0534212	-53.754478	0.0025598	20.626591	-0.0502455	-99.14266	0.0027864	20.858512	-0.054895	-78.623604
RAND[1-0]	-0.0548809	-1.10384631	0.0210492	1.1079972								
MAINCITY[1-0]	0.3503851	2.80649117	0.0468493	1.2825753								
AUTOMOBI					-2.8312191	-44.54661	-1.7287156	-66.18093	-2.4611872	-40.6649384	-1.654848	-43.043438
AGEB[1-0]	-1.3715252	-9.0607944	-0.379709	-6.4183184	-0.2318006	-2.649479	0.1689602	5.2284759	-0.4175447	-4.00377321	0.4607005	7.9434002
AGEC[1-0]	-1.3490631	-10.1310762	-0.2244372	-4.0847611	-0.0769379	-1.0102021	0.5514324	15.284451	-0.1975945	-2.15560993	0.8548358	16.100059
AGED[1-0]	-0.2497819	-1.51122855	0.1549099	2.0014275	0.3415123	3.9779369	0.8875621	16.840997	0.4436544	4.80624206	1.0123237	17.617641
CHILDREN[1-0]	-0.5253751	-3.22384468	-0.0362971	-0.6481058								
VERYHIGH[1-0]	2.0096264	12.6650474	0.6441703	10.112088	2.0655646	28.777204	0.5231366	17.224249	2.0767158	28.3761335	0.3853921	9.0961569
HIGHU[1-0]	0.8949422	5.54787234	0.2940661	5.3332546	1.0140123	14.153564	0.1358569	5.8168403	0.9286553	13.1664603	0.0688112	2.156836
MEDIUMU[1-0]	0.2115417	1.17589334	0.1679047	3.0799213	0.2889748	3.343873	0.0160695	0.6485416	0.3975934	4.87473811	0.0340137	1.0444945
LOWU[1-0]	0.0596108	0.33103371	0.0028091	0.0479727								
HIGHEDUC[1-0]	0.2048105	8.54681371	0.1000629	6.619098	0.1172572	8.9301367	0.0653117	10.250803	0.2871342	13.0271009	0.1187157	9.470058
N	21172				75656				43552			
DF	32,00				24				24			
ChiSquare	21009.31				37502.92				23436.4			
L(β)	-12091.689				-41885.200				-25768.865			
L(0)	-16791.512				-60636.659				-37487.065			

The degree of urbanisation level has a similar effect. The higher the degree of urbanization level, the higher the preference for the use of private car for shopping activities. This result show that although more opportunities are potential located closer in high density areas, which may be highly accessible for non motorized modes and public transportation , the preference for using a private car is higher. This tendency remains stable over the years, while for public transport it is continuously decreasing, in comparison also to non-motorized modes.

It is noticeable that shopping distance is significant variable affecting the mode choice. And both private car and public transport are preferred over non-motorized modes as the distance increases. Supporting previous results of male travelling further, here again, one may notice that male tend to prefer the use of the private car both over public transportation and non-motorised modes of transport, with a slight change in 2005 . Interesting result is

that higher educated persons tend less to use the private car in comparison to public transportation and non-motorized modes of transport.

Summary

The 20th century is characterized by fundamental changes in personal mobility and consequently in aspects such as technology, economy and lifestyle. Retail systems, as an inseparable element of personal activities, have gone through significant structural transformations. This paper aimed to understand the changes in consumers' shopping behavior that occurred in the Netherlands in the past two decades. The trends in shopping activity pattern have been depicted in this paper mainly as a descriptive analysis from which several interesting results can be pin point and these raise some new questions and hypotheses.

Although there are reports for increase in retail sales in the Netherlands, similar to other developed countries, there is little evidence for large impacts on related travel behaviour. Shopping as an activity purpose is stable, and even slightly decreases, in its proportion in relation to other activities (i.e. work, leisure etc). this may imply that time allocation for shopping do not change significantly over the year, however time handling seems to be more efficient in terms of purchased goods. Travel distances have not changed for shopping purposes while trip duration has slightly decreased, probably due to the raise in car ownership and the increase use by women. The variations between the changes of travel distances over the years between work related trips and shopping related trips may imply on major differentiation in travel activity patterns. While for work, criss-cross patterns may apply, for shopping purpose it may not apply. Shopping timing has also stayed stable over the years despite the relaxation of opening hours, although the results from 2005 may point to the adaptation of the previously unavailable times.

The models discussed in this study show that the correlation between the degree of urbanized area and the distance travelled is positive and there is also a higher propensity to shop within home municipality for higher densities. However it shows that higher densities raises the probability to use the automobile over other modes of transport. These results suggest the the criss cross pattern of commuting in Polycentric regions do not apply to shopping travel patterns.

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