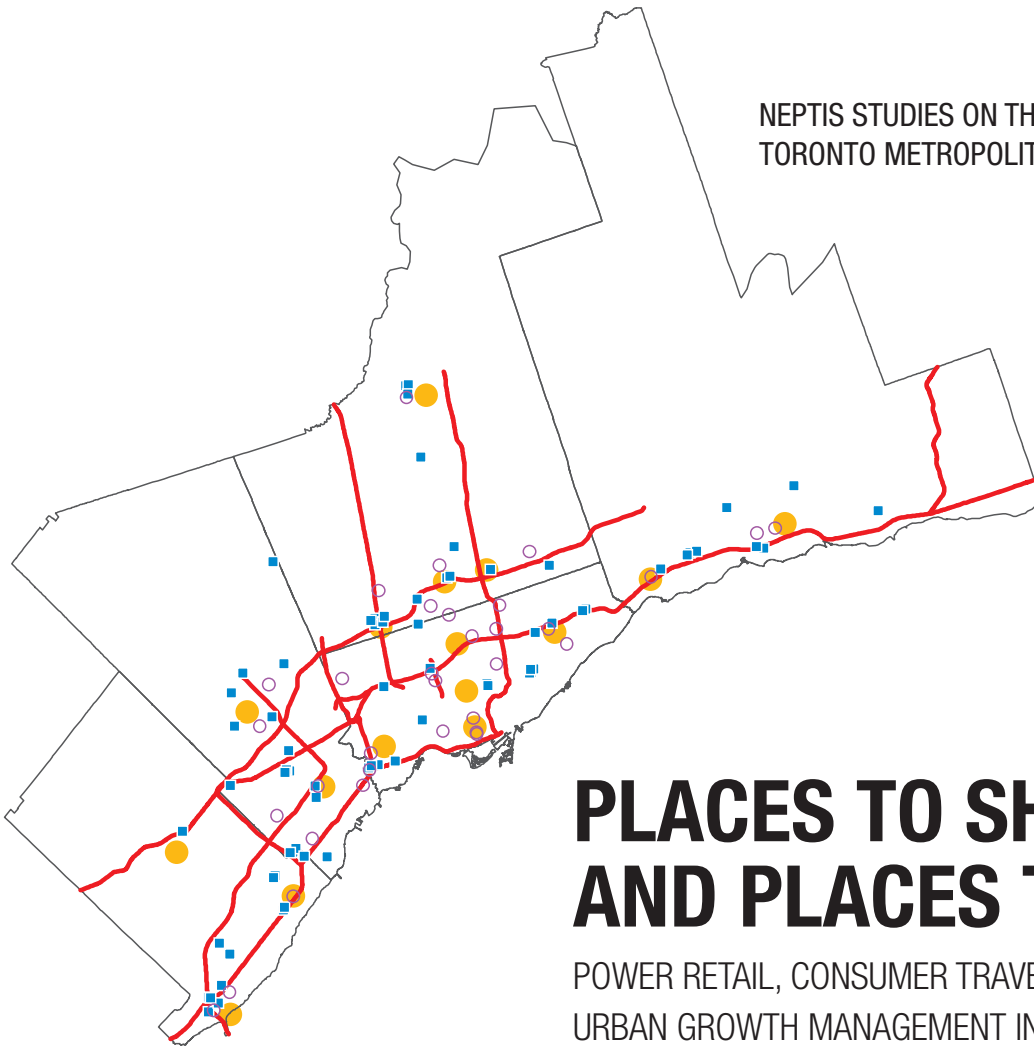


NEPTIS STUDIES ON THE
TORONTO METROPOLITAN REGION



PLACES TO SHOP AND PLACES TO GROW

POWER RETAIL, CONSUMER TRAVEL BEHAVIOUR, AND
URBAN GROWTH MANAGEMENT IN THE GREATER TORONTO AREA

APRIL 2009

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NEPTIS THE ARCHITECTURE OF URBAN REGIONS

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MANAGEMENT IN THE GREATER TORONTO AREA

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Neptis is an independent Canadian foundation that conducts and publishes nonpartisan research on the past, present and futures of urban regions. By contributing reliable information, expert analysis and fresh policy ideas, Neptis seeks to inform and catalyze debate and decision-making on regional urban development.

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The authors gratefully acknowledge the comments and suggestions of four anonymous reviewers.

Foreword

This report is a pioneering effort to juxtapose information on travel patterns in the Greater Toronto Area with information on the distribution and format of retailing, and further, to compare the insights from that process to growth management efforts in Toronto region. It describes the rise of power retailing, identifies the geographical distribution of power centres in the Greater Toronto Area, and traces consumer travel patterns associated with shopping within the region.

This area has not been researched in any systematic way, unlike commuting travel patterns, which have been extensively mapped and studied. The Neptis Foundation, a non-partisan research foundation that aims to fill gaps in research on urban regions, commissioned this study to shed light on an important but poorly understood part of the Toronto region's transportation patterns. We hope that the report stimulates discussion of this topic and its region-wide implications for transportation and growth management policies.

The report argues that planners and policy-makers need to pay closer attention to the interaction of retailing and transportation. The retail sector represents more than a quarter of gross domestic product in Canada, and employs more than one in every ten Canadians. Meanwhile, data from the Transportation Tomorrow Survey suggest that travel for weekday shopping is not only increasing, but growing more rapidly than travel for other purposes.

Retailing as a land use also represents one of the forces shaping urban regions. Retailing patterns change much more rapidly than other forms of land use, in response to demographic shifts, economic trends, and even fashion. Furthermore, retail development is spatially uneven. Power centres and power nodes have mushroomed in suburban and exurban areas close to highways since the 1990s, while the growth of shopping malls has almost completely stalled. Power retail is now moving into urban locations. However, much of this development has occurred in the absence of plans to balance such growth with problems such as traffic congestion.

The primary objective of the Province of Ontario in establishing the new Growth Plan for the Greater Golden Horseshoe, Metrolinx, and a web of supporting legislation is to promote sustainable growth patterns and compact, complete communities in the region. Although the Growth Plan addresses the redesignation of employment lands to make way for big-box retailing, it does not specifically deal with power retailing and its cross-regional effects on transportation. The Province is, however, continuing to refine its policies on employment and employment land uses in further growth management documents.

The current economic downturn may once again reshape the retail landscape in new ways. It may even represent an opportunity to encourage more sustainable development through the redevelopment of existing retail locations. Meanwhile,

the aging baby boom generation may demand more convenient forms of shopping that spread-out power centres in exurban locations cannot provide. The time may be right for developing long-term regional plans for retail, since power retailing operates at the regional scale.

The results of this research and the importance of power retailing in regional urban formation underline the vital role of the Province if more strategically located, integrated, and compact retail formats are to be achieved and to help fulfil the goals for a better region. Since large-format retailing is a cross-regional issue, only the Province, through its regional growth management powers, can level the playing field among municipalities for power retail.

The Neptis Foundation is pleased to support this effort to come to grips with the ways in which retailing shapes our environment and the opportunities it presents for promoting a healthier and more sustainable city-region. Although further research is needed to deepen our understanding of the interaction of transportation and retailing, this report serves as an important starting point for debate.

Tony Coombes
Neptis Foundation
2009

Executive Summary

Although retail and service industries contribute greatly to Canada's economy and the economies of Canadian city-regions, the effects of new forms of retailing on transportation patterns are often overlooked in planning. Most often, transportation planning has focused on the journey to work, rather than travel for other purposes, including shopping. The rise of big-box stores in the outer suburbs and the clustering of big-box stores in power centres and power nodes has affected travel patterns, but these patterns are not yet well understood.

This study describes the rise of power retailing, shows where power centres are clustered in the Greater Toronto Area, and draws on data from the Transportation Tomorrow Survey to describe consumer travel patterns associated with retail development within Canada's largest city-region.

Although only one new enclosed shopping mall has been built in the GTA since the mid 1990s, between 1995 and 2005 the number of big-box stores essentially doubled to more than 1,100. Most were built in the suburbs and on the urban fringe, where large areas of land are available relatively cheaply. In particular, power centres and power nodes tend to locate near highway interchanges.

Whereas shopping malls typically incorporate transit facilities (with transit stops or even hubs close to mall entrances) and are designed so that shoppers can walk from one store to another, power centres are generally developed with the automobile in mind. Individual stores are often so spread out, and the pedestrian environment is so exposed and dysfunctional, that shoppers visiting two or more stores will typically drive from one store to another within the centre.

The peak times for weekday driving to malls and power centres are mid-morning, early afternoon, and early evening (after work). For the most part, shoppers time their trips so as not to coincide with the peak periods of travel for work, but the afternoon peak commuting period is nonetheless intensified by a certain amount of travel for shopping, including trips made to malls and power centres.

These trends run counter to the policies of the new Growth Plan for the Greater Golden Horseshoe (MPIR, 2006), which promote compact, complete communities. Many of the Urban Growth Centres (UGCs) identified in the plan are served by power centres, and these power centres may compete with other retail opportunities (e.g., commercial strips and enclosed malls) serviced by a range of transportation alternatives.

The Growth Plan for the Greater Golden Horseshoe presents a vision of sustainable communities in which people travel less by car, use transit more, and have opportunities to live, work, and shop in mixed-use areas, yet it offers minimal guidance for using retail to achieve growth management and sustainability goals. Its policies focus rather on residential intensification and on other forms of employment, such as offices. Although the Province is continuing to develop its policies for employment, including retail, further research focused on the role of retailing in achieving sustainability is needed to better align contemporary patterns of growth and travel demand with current land use and transportation planning goals.

The Growth Plan for the Greater Golden Horseshoe presents a vision of sustainable communities in which people travel less by car, use transit more, and have opportunities to live, work, and shop in mixed-use areas. Current trends in retailing, however, run counter to these goals.

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Introduction

Retail shopping is an essential human activity, providing for the satisfaction of consumer needs and desires, opportunities for employment, and a form of recreation. The retail industry is a key part of the Canadian economy. In 2007, total retail sales (including automotive) were \$412.2 billion or 25.7 percent of the gross domestic product (Statistics Canada, 2007). More than 1.8 million Canadians, approximately 12 percent of the Canadian workforce, are employed in the retail sector (Statistics Canada, 2008). Urban areas are shaped in part by the nature and vibrancy of commercial environments, and by consumer interaction with these commercial spaces. Even minor shifts in income levels, demographics, lifestyles, or the economic fortunes of an area can lead to rapid changes in the form and structure of retailing. As a result, the retail landscape is constantly evolving. New stores open, new formats appear, existing stores shut up shop, and the location and mix of stores changes constantly (Lorch and Hernandez, 2007).

More than 1.8 million Canadians, approximately 12 percent of the Canadian workforce, are employed in the retail sector.

During the last few decades, new forms of retail have emerged, notably large-format stores located close to suburban highway interchanges. Innovation in the design and construction of retail structures and the growth of suburban markets have helped transform city-regions. At the same time, corporate store branding and franchise systems, with their consistent use of materials and designs in the construction of retail outlets, make it possible to transform brownfields, greyfields, or greenfields to retail establishments within a matter of months.

Evidence for the suburban focus of the new retail economy (Jones and Doucet, 2000) and for changes in the ways consumers interact with retail destinations (Lorch, 2005; Buliung et al., 2007) suggests that the retail economy and consumer mobility are affecting the organization, function, and appearance of city-regions. Yet current transportation plans, systems, and programs do not, for the most part, deal with the direct and indirect effects of the rapid expansion of retail capacity close to highways. The consumer response, however, has been remarkable, as consumers increasingly do their shopping at auto-oriented retail sites in the suburban and exurban spaces of city-regions (Buliung et al., 2007).

Current transportation plans do not, for the most part, deal with the effects of the rapid expansion of retail capacity close to highways.

This report examines, within the context of an urban growth management framework, the impact of retail change on consumer travel behaviours within the Greater Toronto Area (GTA). The key objectives of the report are:

- to identify the key elements of the retail landscape and provide a framework for analyzing change in retail activities and consumer travel behaviours;
- to examine structural changes in the GTA's urban retail system across space and time;
- to explore the relationship between retail change and consumer travel behaviour in the GTA;

Figure 1: The Greater Toronto Area (GTA): regional municipalities, cities, and the 400-series highway system



- to discuss the implications of retail and travel behaviour change in the GTA in relation to the regional urban growth management initiatives of the Province of Ontario, particularly the Growth Plan for the Greater Golden Horseshoe and the creation of the Greenbelt.

Study area

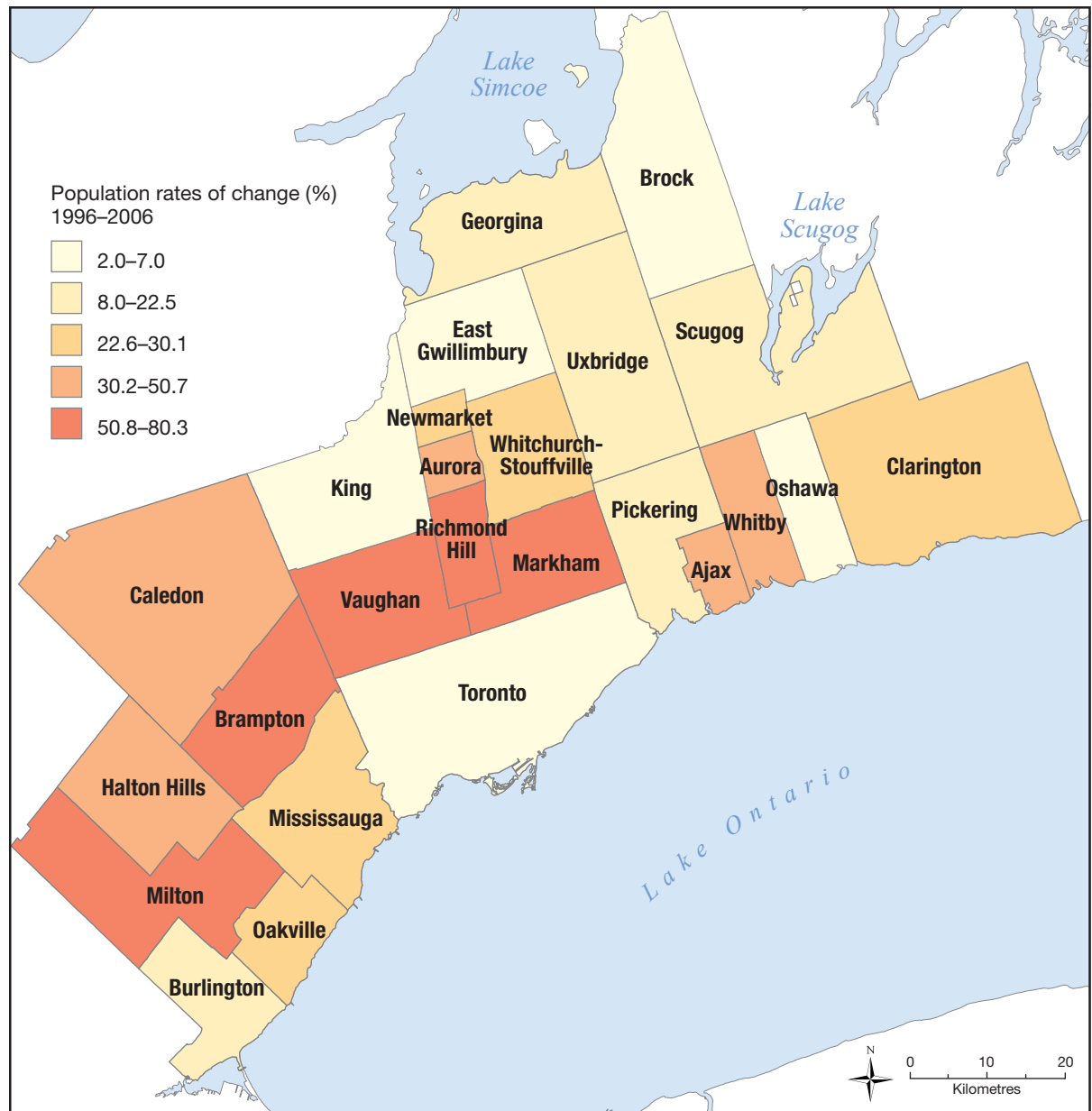
The study area encompasses the majority of Canada's largest urbanized market, the Greater Toronto Area (GTA) and includes the City of Toronto and the regional municipalities of Halton, Peel, York, and Durham (**Figure 1**). Although the Toronto-centred region is now generally thought of as the much larger area of the Greater

Table 1: Residential population change in the GTA: 1996–2006

Municipality	1996	% of total	2006	% of total	% Change
Ajax	64,430	1.39	90,167	1.62	39.95
Aurora	34,857	0.75	47,629	0.86	36.64
Brampton	268,251	5.80	433,806	7.81	61.72
Brock	11,705	0.25	11,979	0.22	2.34
Burlington	136,976	2.96	164,415	2.96	20.03
Caledon	39,893	0.86	57,050	1.03	43.01
Clarington	60,615	1.31	77,820	1.40	28.38
East Gwillimbury	19,770	0.43	21,069	0.38	6.57
Georgina	34,978	0.76	42,699	0.77	22.07
Halton Hills	42,390	0.92	55,289	1.00	30.43
King	18,223	0.39	19,487	0.35	6.94
Markham	173,383	3.75	261,573	4.71	50.86
Milton	32,104	0.69	53,939	0.97	68.01
Mississauga	544,382	11.76	668,549	12.03	22.81
Newmarket	57,125	1.23	74,295	1.34	30.06
Oakville	128,405	2.77	165,613	2.98	28.98
Oshawa	134,364	2.90	141,590	2.55	5.38
Pickering	78,989	1.71	87,838	1.58	11.20
Richmond Hill	101,725	2.20	162,704	2.93	59.94
Scugog	18,837	0.41	21,511	0.39	14.20
Toronto	2,385,421	51.53	2,503,281	45.06	4.94
Uxbridge	15,882	0.34	19,169	0.35	20.70
Vaughan	132,549	2.86	238,866	4.30	80.21
Whitby	73,794	1.59	111,184	2.00	50.67
Whitchurch-Stouffville	19,835	0.43	24,390	0.44	22.96
Total	4,628,883	100.00	5,555,912	100.00	20.03

Golden Horseshoe, the study uses time-series data that is available only for the GTA.

The GTA is home to roughly 5.5 million residents, 2 million households, and an employed labour force of approximately 2.9 million people. It is one of the largest and fastest-growing metropolitan markets in North America and, according to the 2006 Canada Census of Population, home to five cities (**Table 1** and **Figure 2**) within the top 20 urbanized centres in Canada ranked by resident population — Toronto (1st), Mississauga (6th), Brampton (11th), Markham (16th), and Vaughan (18th). Between 1996 and 2006, population growth was heaviest in the suburban regional municipalities — York (which grew by 50.7 percent in this period), Peel (36 percent), Durham (22.4 percent), Halton (29.2 percent). During the same period, considerably less growth occurred in the City of Toronto (4.9 percent).

Figure 2: Population rates of change (%): 1996–2006

We draw a distinction in this study between the central City of Toronto, and the outer suburban jurisdictions of Halton, Peel, York, and Durham. This type of urban/suburban distinction has been used elsewhere for describing regional retail structure (e.g., Simmons et al., 1998; Jones and Doucet, 2000) and is relevant to the mass suburbanization of retailing over the last half century, particularly the growth in large-format retailing (“big-box” stores). During the 1990s, twice as many large-format stores opened in the suburban areas compared with the City of Toronto (Jones and Doucet, 2000).

The suburbanization of large-format retail — sometimes called “retail sprawl” — in the GTA partly reflects the commercial strategies of the firms involved, which seek to reduce the costs of land and ensure that stores are easily accessible to the driving public. They have implemented these strategies in the absence of a regulatory framework to address the long-term impacts of retail development. The result has largely been the transfer of retail advantage (in the form of convenience and access to low-priced goods) to auto-oriented or auto-dependent suburban households.

During the 1990s, twice as many large-format stores opened in the suburban areas of Halton, Peel, York, and Durham compared with the City of Toronto.

The widespread, rapid, and large-scale development of clusters of big-box stores into “power centres” (see **Table 2** on page 12 for definitions), many of them close to major intersections in the suburbs, is a further development in retailing. This development has accentuated the need for shoppers to rely on the automobile, and thus represents another phase in retail sprawl, following the era of suburban mall development of the 1960s to mid 1980s.

In this study, we use the term “power retail” to refer to the retailers and developers involved in post-1990s suburban retail growth. The latest period of retail change appears to be based on the underlying philosophy that “bigger is better” and “if you build it, they will drive to it.”

Retail location data

Exploring the relationships among changing retail formats, consumer travel behaviour, and recent “smart growth” planning strategies requires specialized data to describe both the distribution of retail facilities by type and location over different periods, and data on consumer travel flows.

The latest period of retail change appears to be based on the underlying philosophy that “bigger is better” and “if you build it, they will drive to it.”

Data describing the geographic and economic characteristics of the GTA’s retail structure have been drawn from Ryerson University’s Centre for the Study of Commercial Activity (CSCA) retail databases (see www.cscs.ryerson.ca). Providing a comprehensive inventory of retail activities in the GTA since 1993, the CSCA databases have been used by many researchers to trace the evolution of new retail formats in the Canadian retail economy (see Jones et al., 1994; Jones and Doucet, 1998, 1999, 2000; Simmons and Hernandez, 2004a; Simmons and Hernandez, 2004b). In particular, an annual field survey of power centres, carried out by CSCA staff, that tracks changes in the number, size, and mix of tenants, offers a unique glimpse into the evolution of power retail in Canada. In 2005, the CSCA collected data on more than 50,000 retail locations in the GTA. Each record contains information on the location, size, type of business (using the NAICS codes), and setting (mall, power centre, free-standing, retail strip).¹

1 The North American Industrial Classification System (NAICS) was developed during the late 1990s to replace the Standard Industrial Classification (SIC) system. The United States, Canada, and Mexico developed NAICS to simplify the comparative analysis of economic activity.

The CSCA databases are the most comprehensive source of power retail data in Canada. In 2007, the CSCA collection was extended to cover the entire Greater Golden Horseshoe (GGH).² This expansion will facilitate future analysis of retail change within the area subject to the provincial government's urban growth management policies. This report, however, because it uses time-series data going back to the 1990s, analyzes historical change within the GTA only.

An annual field survey of power centres tracks changes in the number, size, and mix of tenants, and offers a unique glimpse into the evolution of power retail in Canada.

Travel behaviour data

Consumer travel data were taken from the 1996 and 2001 versions of the Transportation Tomorrow Survey (TTS). The TTS is a cross-sectional weekday survey of the travel behaviour of approximately 5 percent of the households within the Greater Toronto Area and beyond (the list of participating municipalities has changed over time). Conducted every five years since 1986, the survey is typically carried out in the fall. Since 1991, travel data have been recorded for persons aged 11 years and older living in participating households. The data are then expanded using factors derived from Census occupied-dwelling counts, to estimate total population and travel behaviour across the survey area (JPT, 2003a, 2003b).

While the TTS provides a reliable sketch of weekday travel behaviour, it cannot be used to study travel behaviour on weekends, which is characterized by greater non-work travel (including shopping), longer trip distances, and lower transit shares (Kitamura and Van der Hoorn, 1987; Hu and Young, 1999; Bhat and Gossen, 2004; Bhat and Srinivasan, 2005; McMillan et al., 2005). Moreover, it does not capture seasonal fluctuations in shopping frequency, duration, schedules, locations, and levels of cross-shopping³ (Roslow et al., 2000; Peter and Olson, 2004). There is no extensive longitudinal record of activity-travel behaviour available for the GTA. Furthermore, the TTS does not systematically record data for non-motorized modes of transportation (e.g., walk, bike, etc.), other than for trips to work or school.

Data from the TTS do suggest, however, that travel for weekday shopping is not only increasing, but growing more rapidly than travel for other purposes (Buliung et al., 2007). It is therefore important to understand the relationship between changes in the spatial structure of the retail economy and the design of retail destinations, and weekday consumer travel behaviour, in order to develop policies to accommodate consumer travel demand within the region's "sustainability" agenda. Moreover, knowing when and how consumers carry out weekday shopping is essential to understanding the competing needs of road users and some of the causes of congestion, and for finding ways to spread the demand for road use across the entire day.

Knowing when and how consumers carry out weekday shopping is essential to understanding the competing needs of road users and some of the causes of congestion, and for finding ways to spread the demand for road use across the entire day.

-
- 2 The Greater Golden Horseshoe comprises the GTA (the City of Toronto and the Regional Municipalities of Halton, Peel, York, and Durham), the Cities of Hamilton and Kawartha Lakes, the Regional Municipalities of Niagara and Waterloo, and Haldimand, Brant, Wellington, Dufferin, Simcoe, Peterborough, and Northumberland Counties.
 - 3 "Cross-shopping" means shopping across retail categories, usually at multiple stores, within a single trip.

A further limitation of the TTS is that the use of automobiles for non-work trips (such as shopping) in non-peak hours tend to be under-reported. Evidence from the United States, for example, points to an increasing share of this form of travel (Gordon et al., 1988; Handy et al., 2002; USDOT FHWA, 1995; USDOT BTS, 2003). Moreover, data on trips that start or end at home over a 24-hour period suggest that since 1986 in the GTA, discretionary trip-making has increased at a faster rate than that of trips to and from work or school (JPT, 2005). The under-reporting of these discretionary trips occurs in part because the TTS asks one adult per household to report the travel behaviour on behalf of all household members (JPT, 2003a). Estimates of consumer travel in this study therefore likely understate actual levels of weekday shopping in the GTA.

Data from the Transportation Tomorrow Survey suggest that travel for weekday shopping is not only increasing, but growing more rapidly than travel for other purposes.

Finally, analyzing consumer travel behaviour over time using travel data for traffic zones requires a stable and consistent delineation of those zones during the period of interest. The TTS zone system, however, has changed from one survey period to the next, responding to changes in the transportation system, population growth, and the addition of new participating municipalities. To get around this difficulty, we have aggregated TTS micro-data (that is, data for areas smaller than zones) to the 2001 system of TTS traffic zones.

Growth and Change in the Retail Market

Shopping is an important part of everyday life — providing both access to consumer goods and opportunities for employment within an increasingly services-oriented economy. Where we shop, how we get there, and what we purchase to some extent defines who we are and how others see us. Our motivations for shopping range from the personal (e.g., self-gratification, role-playing, meeting obligations) to the social (e.g., interaction, communication, peer group attraction) (Tauber, 1972; Underhill, 2000, 2004; Stokan, 2005). Why we shop is clearly a complex process and where we shop is often influenced by a combination of our personal preferences and our response to developmental, planning, and political decisions of which we are not always aware. These decisions collectively influence our choice of travel mode by affecting our access to shopping (and other non-work) destinations.

Where we shop is influenced by our personal preferences and our response to planning and political decisions of which we are not always aware. These decisions collectively influence our choice of travel mode by affecting our access to shopping.

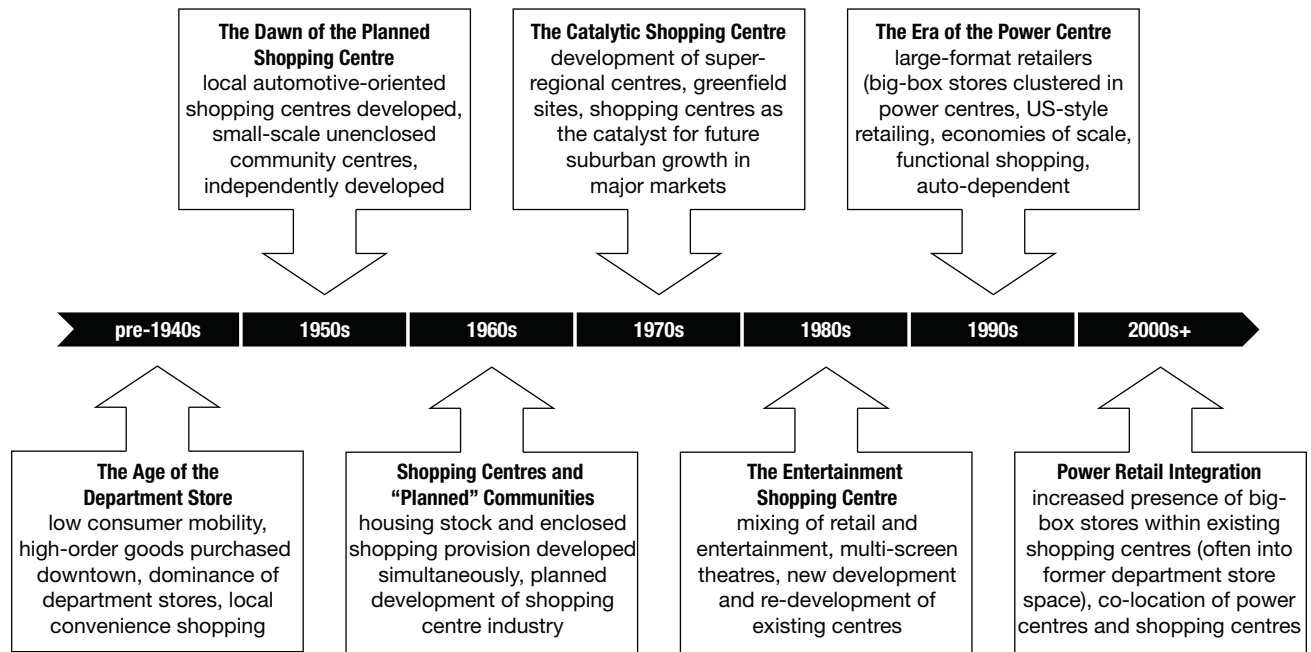
Many researchers have examined the influence of socio-technical processes (including innovation in technologies for moving information and people) on the development of cities and metropolitan regions (Adams, 1970; Audirac, 2002; Castells, 2002; Bourne, 2007). Less attention has been paid to the transformative impact of the retail economy on the size and shape of city-regions.

Recent data suggest that current forms of development have given rise to complex, non-uniform patterns of urban growth and change in Canadian metropolitan regions (Shearmur and Coffey, 2002). Overall, manufacturing and retailing have decentralized, particularly in Canada's eight largest Census Metropolitan Areas, including Toronto (Heisz and LaRochelle-Côté, 2005). Understanding the forces of decentralization, which help account for the changing spatial structure of Canadian city-regions, can advance knowledge about the relationship between urban sprawl and economic growth at the local, regional, and national scales.

Canada's retail landscapes reflect the immense diversity of social classes, incomes, ethnicities, lifestyles, and business formats in our cities. Retail strips, suburban plazas and malls, power centres, downtown shopping areas, and boutique districts are some of the most prominent elements of the urban landscape. The current retail system is the product of a series of complex structural changes and political-economic processes (Berry, 1963; Bromley and Thomas, 1993). The system is highly volatile as new retailers open and existing retailers close or relocate. Minor shifts in the income, demographic, lifestyle, or competitive characteristics of an area can lead to rapid changes in the form and structure of the retail environment (Simmons and Kamikihara, 2007).

Understanding the forces of decentralization, which help account for the changing spatial structure of Canadian city-regions, can advance knowledge about the relationship between urban sprawl and economic growth at the local, regional, and national scales.

The retail fabric of cities responds to demographic, technological, behavioural, and entrepreneurial change. In general, retailers choose their locations in response to market conditions. If the population and income mix of a particular area constitute an appropriate market for retail goods, retailers will attempt to move in. At the same time, the spatial pattern of retail groupings relates to the transportation technology of the time. When mobility was low (that is, before the era of the automobile), retail activities tended to concentrate; as mobility increased throughout

Figure 3: The evolution of the Canadian urban retail system

the postwar era, retail activities tended to become more dispersed. At a finer scale, consumer preferences for particular goods and locations and entrepreneurial decisions in response to those preferences help determine the growth and decline of retail areas. Certain urban shopping areas go in and out of fashion for particular groups. Meanwhile, investment decisions are based on entrepreneurs' evaluation of the prospects of the market over time.

The Canadian urban retail system has experienced several transformations in the last 60 years. These transformations were tied to the evolution of urban structure and transportation: the compact pre-automobile city was succeeded by the dispersed automobile city, which is now giving way to an emerging information city. **Figure 3** shows the major phases of evolution of the Canadian retail system for the period before the Second World War era to the present day.

Retail strips (street-front retail) have always been part of the urban retail system. They can be found in traditional downtowns as main shopping streets, clustered in the inner suburbs (often serving specialized functions), and dispersed throughout the outer suburbs along major arterial roads. Shopping centres date back to the 1950s, with major growth occurring through the mid 1960s to late 1970s. This period saw the build-out of suburban regional and super-regional centres in parallel with rapid suburban residential growth. Since the 1990s, power centres have dominated Canadian retail real estate development; only one new major shopping mall has been built in Canada since the mid 1990s.

The retail system is highly volatile: minor shifts in the income, demographic, lifestyle or competitive characteristics of an area can lead to rapid changes in the form and structure of the retail environment.

The spatial pattern of retail groupings relates to the transportation technology of the time. When mobility is low, retail activities tend to concentrate; when mobility increases, retail activities disperse.

The growth of large-format retail in Canada has been attributed to (1) the implementation of free trade agreements in the late 1980s and early 1990s; (2) the decline in the value of the Canadian dollar (1992-2004); (3) competition effects related to pricing and selection; and (4) innovation in design and site selection – i.e., the trend toward the development of highly visible, auto-accessible locations on inexpensive land (Hernandez and Simmons, 2006; Jones and Doucet, 2000). The rise of power retail in the GTA has resulted in some transformation of what consumers can expect to find at shopping centres (from retail to services), and the wholesale replacement or adaptive re-use of places previously used for other purposes (e.g., enclosed malls, industrial sites).

The growth of large-format retail in Canada has been attributed to (1) free trade agreements; (2) the decline in the value of the Canadian dollar; (3) competition in pricing and selection; and (4) the trend toward siting retail uses on auto-accessible locations on inexpensive land.

The proliferation of large-format retailing and the shift away from the enclosed shopping centre have been reinforced by escalating land costs, the high costs borne by shopping centre tenants (base rent, property tax, common area maintenance fees), and the opening up of markets (and subsequent influx of U.S. retailers like Wal-Mart in 1994) following the free trade policies of the late 1980s and early 1990s.⁴ The result has been the production of a highly suburbanized auto-oriented retail landscape dotted with big boxes, power centres, and power nodes, accessible primarily by automobile — places with lower capital and operating cost structures than other retail formats.

The introduction and subsequent growth of large-format and power centre retailing did not occur either quickly or at the same rate through time (Jones and Doucet, 2000). While much of the growth of large-format retailing in the GTA occurred during the 1990s, early signs of what was to come emerged in the GTA as early as the 1960s — IKEA opened in 1962, Leon's in 1973, and Knob Hill Farms in 1971 (Jones and Doucet, 2000, 2001). The data also suggest that the growth of the retail economy in general, and big-box retailing specifically, has ebbed and flowed alongside the success and failure of the broader regional economy. For example, the recession of the early 1990s was a period of slow growth in big-box retailing in the GTA (Jones and Doucet, 2000). Overall, and despite short-term cycles of growth, the staying power of large-format retail derives from its dramatic success relative to other retail formats (Jones and Doucet, 2000).

4 The authors would like to thank Gordon Harris for his insights.

The Retail Hierarchy

Planners and retail developers have long maintained the idea of a retail hierarchy in which smaller centres are expected to serve local areas, and larger retail groupings serve wider regions. Recently, however, the boundaries between the traditional dominant retail types have become increasingly blurred and it is often difficult to categorize retail developments neatly. “Lifestyle-focused” developments and mixed-use projects have contributed to this uncertainty (Hernandez, 2007). While acknowledging the retail classification problem, in this study, we identify three primary forms of retail location type: the retail strip, the shopping centre, and power retail.

Retail strips

Retail strips are one part of an increasingly complex retail system. Traditionally, chain stores tended to dominate shopping centres, while independently owned shops were found in central city or retail strip locations. Indeed, an important aspect of retail strips is their functional specialization (Leigh, 1965; Jones, 1984; Sinopoli, 1996). Strips often specialize in a particular type of economic activity or serve a distinctive market. A major source of variation is the size of the strip, measured either in the number of stores or in floor area. The smaller strips often start out as convenience centres serving a local market, then expand to serve more extensive markets, and perhaps even specialize in a specific market that draws customers from across the metropolitan region.

Over time, some strips have maintained or even strengthened their position, while others have declined. Many of the older retail strips date from the era of streetcars or other forms of transit (e.g., omnibuses and horse cars) along main routes within a (relatively) high-density residential environment. Many of these traditional strips were originally oriented toward the needs of the pedestrian shopper, and later partially or entirely reshaped to accommodate automobiles. By contrast, most of the retail strips built over the past 60 years are located in the suburbs, geared towards the suburban shopper with an automobile, and parking has always been provided. Recently, major retail chains have taken notice of infill opportunities in retail strips both in traditional downtowns and in the inner suburbs, as suburban markets have become increasingly saturated.

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Shopping centres

Shopping centres range from major enclosed super-regional malls that draw customers from across the region, to small-scale shopping plazas serving local markets. The International Council for Shopping Centers (ICSC) defines a shopping centre as a retail property planned, built, owned, and managed as a single entity, comprising commercial rental units and common areas, with a minimum size of 10,000 square feet (see www.icsc.org). Within this definition, several subtypes exist. *Traditional centres* range from small-scale convenience, through to

neighbourhood, community, regional, and super-regional centres. This traditional hierarchy is embedded within the planning system, albeit with variations across planning jurisdictions.

The ICSC also identifies *speciality centres*, including power centres (see below), factory outlets, and lifestyle centres. In this study, power centres are defined as a separate location type — within Canada they are often not managed as a single entity.

Power retail: big boxes, power centres, and power nodes

Much of the growth in retail in Canada over the last 15 years has been in the form of big-box stores (**Table 2**). These stores are also known as “destination” retailers or “category-killers” because they offer very wide selection at a particular store, allowing customers to make comparisons between different brands of the same type of item within a single store, rather than comparison shopping among different stores in a regional shopping centre or along a commercial strip in a traditional downtown (Bodkin and Lord, 1997; ICSC, 2004).

Initially, big-box stores were built on arterial streets, or within conventional shopping centres. *Power centres*, which bring together several big-box stores of different kinds, are a more recent phenomenon. As the number of big-box chains and big-box stores multiplied, developers created specialized power centre locations to attract big-box stores.

Power nodes are typically located close to highway interchanges and consist of groups of big-box stores or power centres. They may also contain conventional stores and malls (Yeates, 2000). Power nodes represent the competitive advantages of clustering retail activities in a single location.

Power nodes — groups of big-box stores or power centres — represent the competitive advantages of clustering retail activities in a single location.

Table 2: Power retail concepts

Retail Structure	Typical Configuration
Big-Box Store	Retail outlets typically three or more times larger than other comparable stores. The definition of big-box varies by sector and is determined by gross leasable area.
Power Centre	Three or more big-box retailers with shared parking lot and ancillary commercial services (e.g., smaller retailers, fast-food outlets) (Hernandez et al., 2007).
Power Node	One or more power centres with additional big boxes or major malls within a one kilometre radius, typically close to a major highway interchange.

The Changing Spatial Structure of Retailing in the GTA

The rate and scale of retail change of power centres within the GTA is shown in **Figure 4**. The growth in the number of suburban power centres between 1996 and 2006 was driven by rapid growth in new suburban residential subdivisions. These locations provide the necessary mix of relatively low-cost land and large parcels of land available for development.⁵

The rapid evolution of power retail is illustrated by the Highway 400 and Highway 7 power node (**Figure 5**). This node grew from less than 250,000 sq. ft. of retail space in 1996 to more than 2 million sq. ft. in 2005, expanding from a single power centre to four. The scale of change is the equivalent of adding two super-regional shopping malls at the intersection. What makes this growth even more astounding is the opening in November 2004 of the Vaughan Mills Shopping Centre within a few kilometres of the same intersection, adding an additional 1.2 million square feet (with additional development potential in nearby parcels). By 2006, there was over 5 million sq. ft. of retail within a five-kilometre radius of the intersection of Highways 400 and 7.

The change in retail space within the GTA between 1996 and 2006 is shown in **Table 3**. Of particular note is the change in the number and square footage of power centres, which increased from 24 in 1996 to 79 in 2006, representing the addition of over 19 million sq. ft. of retail space. In 1996, power centres accounted for 4.4 percent of all retail space in the GTA; by 2006 this proportion had increased to 16.5 percent.

In contrast, there was little change in the major regional and super-regional centres, except for the addition of Vaughan Mills, and the renovation of several other centres. Most shopping centre growth was in the form of new suburban community and neighbourhood centre developments in the suburbs, also reflected in the growth of additional suburban retail strips. The number and size of freestanding stores also increased, largely because of the development of major grocery, pharmacy, warehouse, and discount department stores.

The final column in **Table 3** indicates how the share of total retail sq. ft. for each format changed between 1996 and 2006. While shopping centres retain the largest overall share, power centre square footage has increased dramatically, and the share of most other formats has declined.

Tables 4 and 5 show total retail square footage and power retail square footage by municipality across the GTA between 1996 and 2006. In terms of absolute growth, the largest increases occurred in Toronto (10.6 million sq. ft.), Brampton

In 1996, power centres accounted for 4.4 percent of all retail space in the GTA; by 2006 this proportion had increased to 16.5 percent. In contrast, there was little change in the major regional and super-regional centres.

5 The speed of change is also related to the fact that big-box stores are simple structures that can be built relatively quickly. In some cases, these large, warehouse-like structures are considered “interim” land uses, since they can also be demolished easily to make way for more permanent buildings or more intensive land uses.

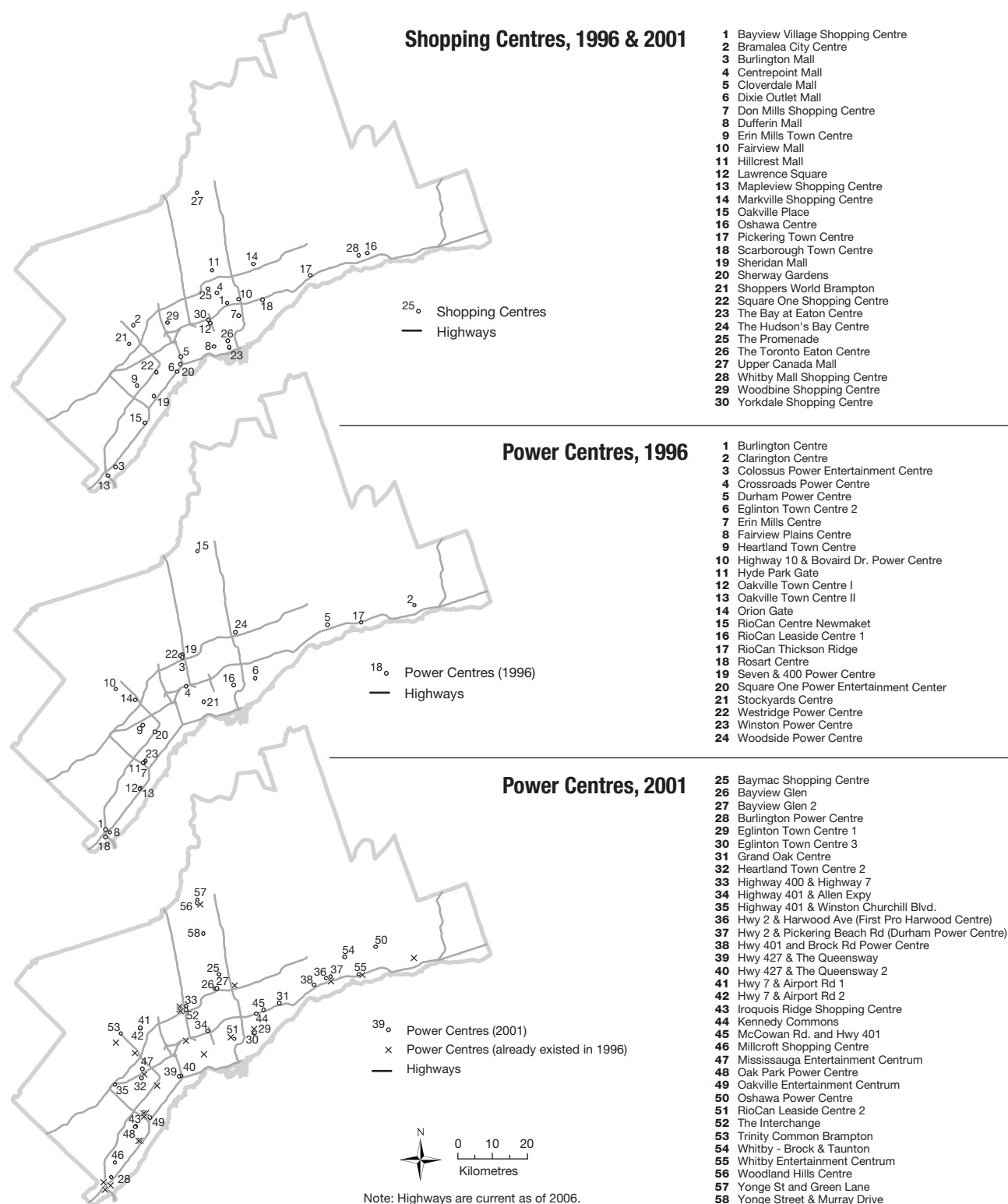
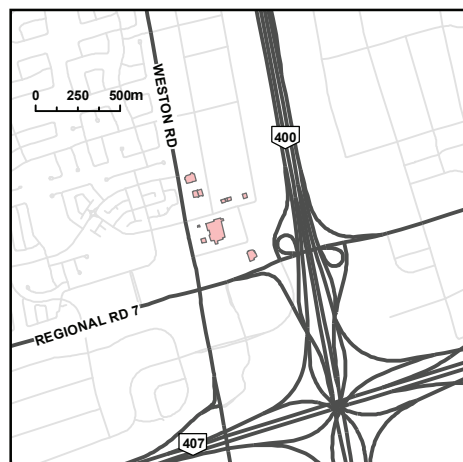
Figure 4: Retail locations in the GTA: 1996 and 2001

Table 3: Retail change by location type in the GTA: 1996–2006

Type	1996			2006			1996–2006		
	#	ft. ² (millions)	% of total	#	ft. ² (millions)	% of total	#	ft. ² (millions)	% change
Super regional	15	15.2	14.17	16	17.1	11.79	1	1.9	–2.38
Regional	16	8.2	7.61	16	8.6	5.94	0	0.4	–1.67
Community	150	28.1	26.24	172	32.2	22.2	22	4.1	–4.04
Neighbourhood	361	20.2	18.83	436	24.3	16.78	75	4.1	–2.05
Convenience	7	0.2	0.16	20	0.4	0.29	13	0.2	0.13
Shopping centres	549	71.8	67.02	660	82.6	57.01	111	10.8	–10.01
Power centres	24	4.7	4.42	79	23.9	16.49	55	19.2	12.07
Strips	262	30	27.98	303	35.6	24.59	41	5.6	–3.39
Free standing	16	0.6	0.58	173	2.8	1.91	157	2.2	1.33
Total	851	107.2		1,215	144.9		364	37.7	

Table 4: Total retail square footage in the GTA by municipality: 1996–2006

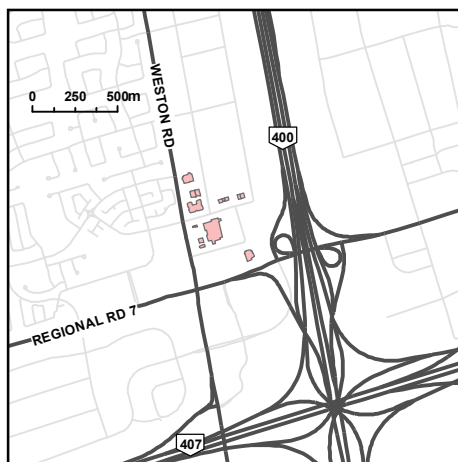
Municipality	1996		2006		Change 1996–2006	
	ft. ² (millions)	% of total	ft. ² (millions)	% of total	ft. ² (millions)	% change
Total GTA	107.17	100%	144.94	100%	37.77	35.24
Ajax	1.80	1.68%	2.55	1.76%	0.75	41.87
Aurora	0.64	0.59%	1.09	0.75%	0.45	70.91
Brampton	3.56	3.32%	8.31	5.74%	4.76	133.65
Brock	0.13	0.12%	0.16	0.11%	0.03	26.34
Burlington	4.24	3.95%	5.78	3.99%	1.55	36.48
Caledon	0.08	0.08%	0.41	0.28%	0.32	380.81
Clarington	0.48	0.45%	0.90	0.62%	0.42	86.93
East Gwillimbury	0.05	0.05%	0.64	0.44%	0.59	1192.46
Georgina	0.40	0.37%	0.57	0.39%	0.17	42.41
Halton Hills	0.60	0.56%	0.71	0.49%	0.11	18.87
King	0.21	0.20%	0.27	0.19%	0.06	27.30
Markham	4.24	3.96%	5.79	3.99%	1.54	36.40
Milton	0.40	0.37%	0.73	0.50%	0.33	83.35
Mississauga	15.32	14.29%	19.63	13.54%	4.31	28.16
Newmarket	2.74	2.56%	3.63	2.50%	0.89	32.50
Oakville	2.69	2.51%	4.35	3.00%	1.66	61.66
Oshawa	3.14	2.93%	3.99	2.75%	0.85	27.00
Pickering	1.97	1.84%	2.68	1.85%	0.71	35.92
Richmond Hill	3.25	3.04%	4.89	3.38%	1.64	50.45
Scugog	0.25	0.23%	0.33	0.23%	0.08	32.65
Toronto	55.80	52.07%	66.47	45.86%	10.67	19.12
Uxbridge	0.22	0.20%	0.49	0.34%	0.28	128.70
Vaughan	2.91	2.71%	7.27	5.01%	4.36	149.98
Whitby	1.73	1.62%	2.91	2.01%	1.18	68.03
Whitchurch-Stouffville	0.33	0.30%	0.38	0.26%	0.05	15.02

Figure 5: Power node evolution in Vaughan (Highway 400 & 7 Power Node): 1996–2005**1996**

Number of power centres: 1
 Size of power centres: 245,494 sq. ft.

Square footage of power centres:

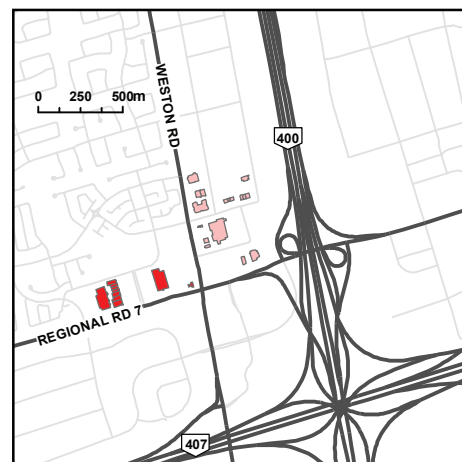
245,494 sq. ft. ■ Seven & 400 Power Centre

**1997**

Number of power centres: 1
 Size of power centres: 303,744 sq. ft.

Square footage of power centres:

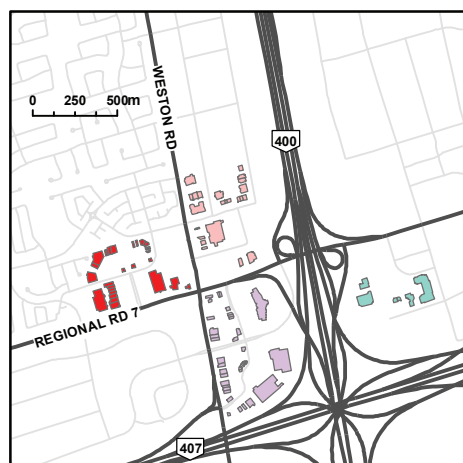
303,744 sq. ft. ■ Seven & 400 Power Centre

**1998**

Number of power centres: 2
 Size of power centres: 604,037 sq. ft.

Square footage of power centres:

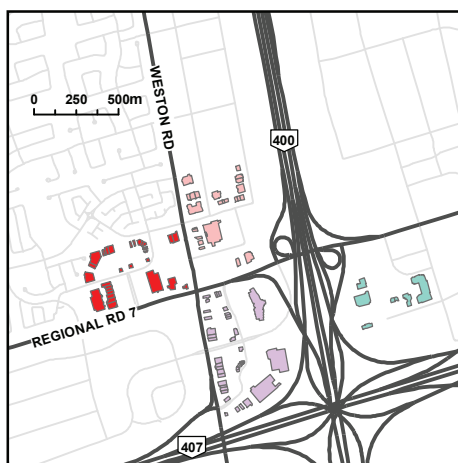
328,087 sq. ft. ■ Seven & 400 Power Centre
 275,950 sq. ft. ■ Westridge Power Centre

**2001**

Number of power centres: 4
 Size of power centres: 1,622,942 sq. ft.

Square footage of power centres:

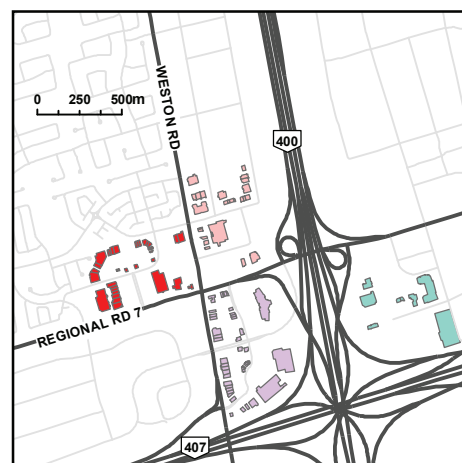
376,587 sq. ft. ■ Seven & 400 Power Centre
 424,400 sq. ft. ■ Westridge Power Centre
 591,201 sq. ft. ■ Colossus Power Entertainment Centre
 230,754 sq. ft. ■ The Interchange

**2002**

Number of power centres: 4
 Size of power centres: 1,713,667 sq. ft.

Square footage of power centres:

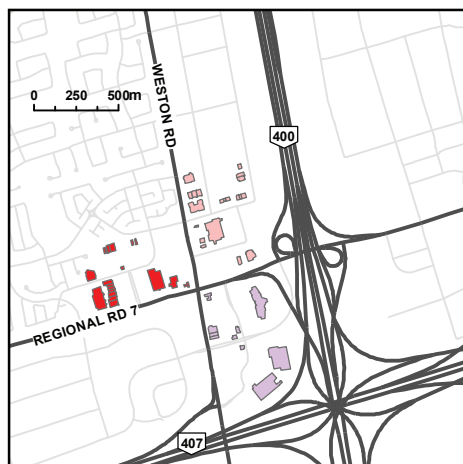
384,839 sq. ft. ■ Seven & 400 Power Centre
 485,220 sq. ft. ■ Westridge Power Centre
 604,854 sq. ft. ■ Colossus Power Entertainment Centre
 238,754 sq. ft. ■ The Interchange

**2003**

Number of power centres: 4
 Size of power centres: 2,075,797 sq. ft.

Square footage of power centres:

385,289 sq. ft. ■ Seven & 400 Power Centre
 498,769 sq. ft. ■ Westridge Power Centre
 627,023 sq. ft. ■ Colossus Power Entertainment Centre
 564,716 sq. ft. ■ The Interchange

**1999**

Number of power centres: 3

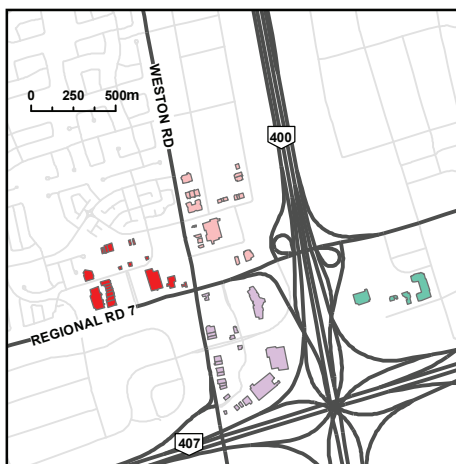
Size of power centres: 1,138,015 sq. ft.

Square footage of power centres:

346,087 sq. ft. ■ Seven & 400 Power Centre

358,150 sq. ft. ■ Westridge Power Centre

433,778 sq. ft. ■ Colossus Power Entertainment Centre

**2000**

Number of power centres: 4

Size of power centres: 1,461,771 sq. ft.

Square footage of power centres:

356,587 sq. ft. ■ Seven & 400 Power Centre

366,450 sq. ft. ■ Westridge Power Centre

537,980 sq. ft. ■ Colossus Power Entertainment Centre

200,754 sq. ft. ■ The Interchange

**2004**

Number of power centres: 4

Size of power centres: 2,188,679 sq. ft.

Square footage of power centres:

399,889 sq. ft. ■ Seven & 400 Power Centre

561,619 sq. ft. ■ Westridge Power Centre

654,455 sq. ft. ■ Colossus Power Entertainment Centre

572,716 sq. ft. ■ The Interchange

**2005**

Number of power centres: 4

Size of power centres: 2,276,403 sq. ft.

Square footage of power centres:

439,545 sq. ft. ■ Seven & 400 Power Centre

584,719 sq. ft. ■ Westridge Power Centre

671,423 sq. ft. ■ Colossus Power Entertainment Centre

580,716 sq. ft. ■ The Interchange

Table 5: Power retail in the GTA by municipality: 1996–2006

Municipality	1996		2006		Change 1996–2006	
	ft. ² (millions)	% of GTA total	ft. ² (millions)	% of GTA total	ft. ² (millions)	% change
Total GTA	4.74	100%	23.90	100%	19.16	404.30
Ajax	0.44	9.20%	1.20	5.02%	0.76	174.78
Aurora	0.00	0.00%	0.11	0.47%	0.11	na
Brampton	0.50	10.65%	2.15	9.00%	1.65	326.19
Brock	0.00	0.00%	0.00	0.00%	0.00	na
Burlington	0.51	10.81%	1.80	7.53%	1.29	251.26
Caledon	0.00	0.00%	0.20	0.83%	0.20	na
Clarington	0.07	1.48%	0.30	1.24%	0.23	322.52
East Gwillimbury	0.00	0.00%	0.58	2.44%	0.58	na
Georgina	0.00	0.00%	0.00	0.00%	0.00	na
Halton Hills	0.00	0.00%	0.00	0.00%	0.00	na
King	0.00	0.00%	0.00	0.00%	0.00	na
Markham	0.34	7.12%	0.63	2.62%	0.29	85.20
Milton	0.00	0.00%	0.26	1.07%	0.26	na
Mississauga	0.66	13.94%	3.06	12.79%	2.40	362.84
Newmarket	0.00	0.00%	0.54	2.25%	0.54	na
Oakville	0.75	15.81%	1.71	7.15%	0.96	128.00
Oshawa	0.00	0.00%	0.48	2.00%	0.48	na
Pickering	0.00	0.00%	0.51	2.14%	0.51	na
Richmond Hill	0.00	0.00%	1.05	4.40%	1.05	na
Scugog	0.00	0.00%	0.00	0.00%	0.00	na
Toronto	0.66	13.94%	5.02	21.00%	4.36	659.64
Uxbridge	0.00	0.00%	0.26	1.09%	0.26	na
Vaughan	0.45	9.52%	2.98	12.47%	2.53	560.31
Whitby	0.36	7.52%	1.07	4.49%	0.72	200.89
Whitchurch-Stouffville	0.00	0.00%	0.00	0.00%	0.00	na

(4.8 million sq. ft.), Vaughan (4.4 million sq. ft.) and Mississauga (4.3 million sq. ft.). Toronto accounted for one-fifth of all power retail square footage in the GTA in 2006, concentrated mainly within the suburbs (and 45 percent of the GTA's total population). However, Toronto's contribution to total retail square footage in the GTA decreased from 52 percent in 1996 to 46 percent in 2006 (**Table 4**). **Table 6** shows the percentage change and per-capita amount of retail space, indicating strong suburban growth.

Table 6: Retail square footage per capita in the GTA by municipality: 1996–2006

Municipality	Retail sq.ft. per capita			Power Retail sq.ft. per capita		
	1996	2006	% change)	1996	2006	% change
Total GTA	23.15	26.09	12.68	1.02	4.30	320.15
Ajax	27.94	28.32	1.37	6.77	13.29	96.35
Aurora	18.29	22.87	25.08	0.00	2.37	na
Brampton	13.27	19.17	44.48	1.88	4.96	163.54
Brock	10.89	13.45	23.45	0.00	0.00	na
Burlington	30.93	35.17	13.70	3.74	10.95	192.64
Caledon	2.13	7.16	236.22	0.00	3.50	na
Clarington	7.92	11.54	45.60	1.15	3.80	229.11
East Gwillimbury	2.52	30.60	1112.77	0.00	27.66	na
Georgina	11.37	13.26	16.66	0.00	0.00	na
Halton Hills	14.19	12.93	–8.86	0.00	0.00	na
King	11.78	14.02	19.04	0.00	0.00	na
Markham	24.47	22.12	–9.58	1.95	2.39	22.76
Milton	12.35	13.48	9.13	0.00	4.75	na
Mississauga	28.14	29.36	4.36	1.21	4.57	276.88
Newmarket	47.95	48.85	1.88	0.00	7.24	na
Oakville	20.97	26.28	25.34	5.84	10.32	76.78
Oshawa	23.38	28.18	20.52	0.00	3.38	na
Pickering	24.95	30.49	22.22	0.00	5.83	na
Richmond Hill	31.98	30.08	–5.94	0.00	6.46	na
Scugog	13.15	15.28	16.16	0.00	0.00	na
Toronto	23.39	26.55	13.51	0.28	2.00	623.87
Uxbridge	13.60	25.76	89.49	0.00	13.62	na
Vaughan	21.93	30.43	38.72	3.40	12.47	266.41
Whitby	23.48	26.19	11.52	4.83	9.65	99.71
Whitchurch-Stouffville	16.45	15.39	–6.46	0.00	0.00	na

Figures 6a and **6b** show the spatial distribution of power centres across the GTA according to their accessibility in terms of the number of minutes drive from residential areas. Four drive-time intervals (5, 10, 15 and 20 minutes) were generated around each power centre location. **Figure 6b** clearly shows the suburban expansion of power centres and the addition of new centres in the urban core.

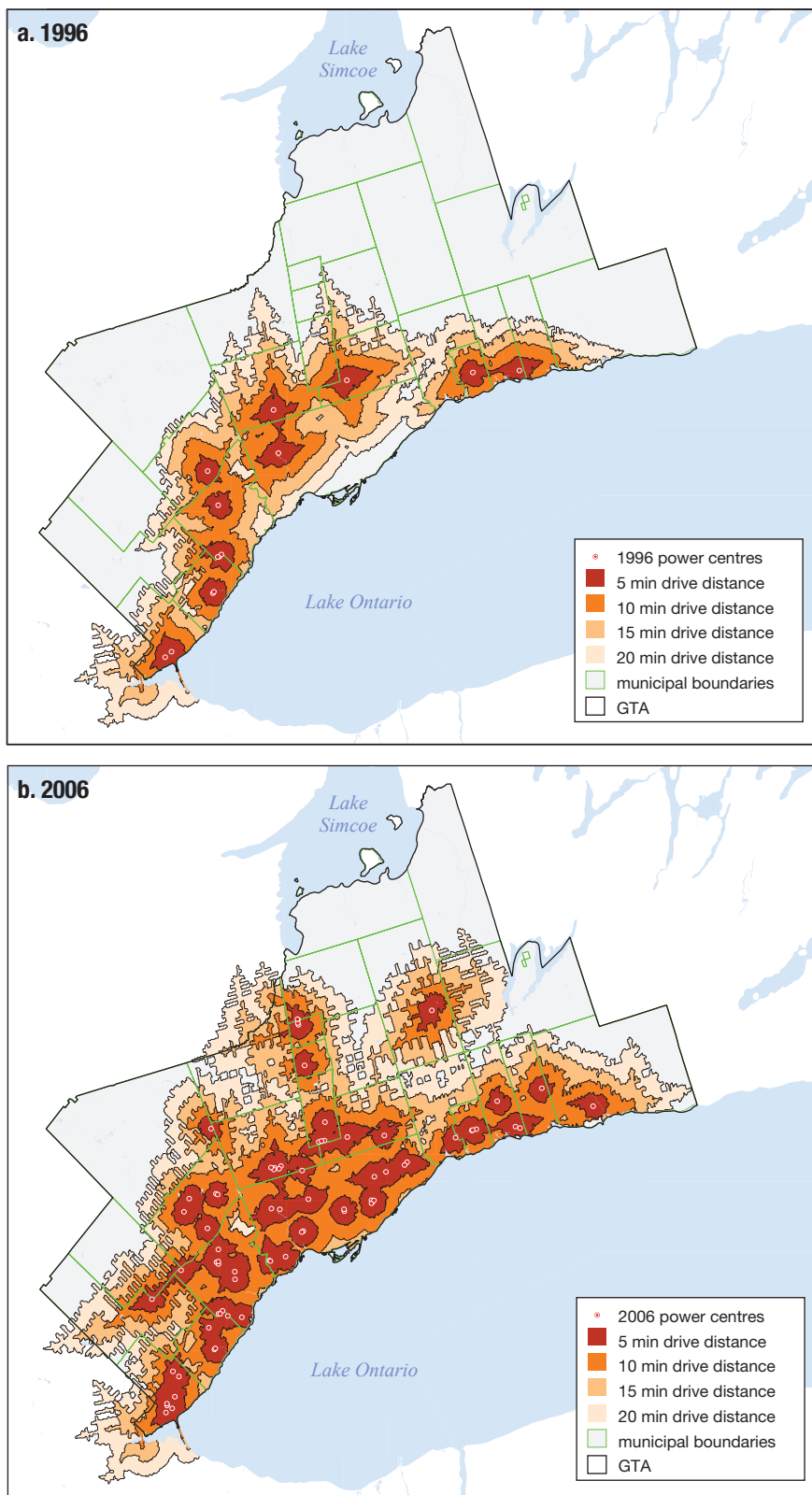
Figure 6: Drive-time zones around power centres: 1996–2006

Table 7: GTA population within proximity to power centre locations: 1996–2006

Demography	Drive Time (min)	1996		2006	
		%	No.	%	No.
Population	5	10.57	488,014	44.38	2,450,428
	10	40.15	1,853,804	91.94	5,076,948
	15	65.49	3,023,774	96.48	5,327,653
	20	79.31	3,661,567	97.91	5,406,313
Dwellings	5	10.04	162,841	43.41	891,001
	10	37.12	601,938	91.54	1,878,569
	15	62.30	1,010,179	96.57	1,981,875
	20	77.49	1,256,417	97.89	2,008,906

Table 7 also shows how the growth of power centres has resulted in a situation in which the vast majority of residents within the GTA now live within a short drive of a power centre. In 1996 just over 40 percent of GTA residents lived within a 10-minute drive to a power centre; by 2006 this number had increased to nearly 92 percent, and nearly 100 percent of GTA residents lived within a 20-minute drive of a power centre.

Table 8 breaks the drive-time analysis down by municipality. For example, in 1996, 19 percent of Vaughan residents lived within a 5-minute drive of a power centre, by 2006 this percentage had increased to approximately 35 percent, while 83 percent lived within a 10-minute drive of a power centre, and every single resident lived within a 20-minute drive.

Today, nearly all GTA residents live within a 20-minute drive of a power centre.

This rapid expansion of power centres, coupled with increases in auto ownership and use and consumer demand for low prices and convenience, has given power centres a competitive advantage relative to other forms of retailing, particularly in the outer suburbs.

Finally, we should acknowledge important differences between the Canadian and United States retail systems. The evidence suggests a temporal lag between the introduction and adoption of retail formats in the United States and the subsequent adoption and development of similar formats in Canada. For example, the “lifestyle” centres⁶ that have appeared recently in the United States (the International Council of Shopping Centres estimates that there are roughly 160 such centres in the United States) have not been widely developed in Canada. At the time of the writing, there were probably fewer than five lifestyle centres in Canada.

The “lifestyle” centres that have appeared recently in the United States have not been widely developed in this country.

6 A lifestyle centre is structurally and functionally different from a power centre. Lifestyle centres usually serve an upscale market, contain a mix of activities, and are designed to replicate some of the pedestrian facilities found in traditional downtowns — that is, they tend to look like main streets or villages rather than malls or big-box centres.

Table 8: Percentage of population within 5-, 10-, and 20-minute drives to power centre locations, by municipality: 1996–2006

Municipality	Drive-time (minutes)					
	5		10		20	
	1996	2006	1996	2006	1996	2006
Total GTA	10.57	44.38	40.15	91.94	79.31	97.91
Ajax	60.56	69.20	92.19	99.72	92.81	99.97
Aurora	0	63.39	0	93.05	1.71	100.00
Brampton	12.38	49.96	70.08	96.63	99.44	100.00
Brock	0	0	0	0	0	2.13
Burlington	39.39	72.08	79.18	92.47	93.93	99.47
Caledon	0	22.40	0	44.75	1.42	62.96
Clarington	0	29.44	2.74	74.82	50.99	94.14
East Gwillimbury	0	6.50	0	41.78	0	64.85
Halton Hills	0	0.73	0.03	2.28	2.49	30.20
King	0	0.49	0	6.93	39.38	94.51
Markham	20.25	43.96	81.33	95.57	99.94	100.00
Milton	0.10	34.09	0.98	86.75	16.51	95.08
Mississauga	14.84	54.93	49.50	97.91	98.86	99.96
Newmarket	0	52.07	0	94.79	0.46	100.00
Oakville	41.67	52.10	88.25	94.01	90.98	100.00
Oshawa	12.55	34.27	65.97	97.69	96.26	99.51
Pickering	0.01	39.22	47.64	90.64	93.11	99.60
Richmond Hill	6.22	58.53	41.01	93.85	94.71	100.00
Scugog	0	0	0	1.16	0	51.46
Toronto	5.32	41.28	27.10	96.52	76.55	99.94
Uxbridge	0	43.10	0	65.07	0	89.30
Vaughan	19.10	34.62	72.54	82.72	99.75	100.00
Whitby	23.10	51.21	83.24	91.49	94.93	99.60
Whitchurch-Stouffville	0	0	0.50	0.37	23.86	88.31

Also, retail industry trends play out differently across Canadian and U.S. markets. For example, in Canada, the shopping centre industry has not as much abandoned the mall format as it has altered it (i.e., updated, extended, and re-branded malls) to maintain the appeal of this format to Canadian consumers. For example, despite the growth of power retailing in the GTA, the 1.2-million-sq.-ft. Vaughan Mills mall (32 km northwest of downtown Toronto) opened 15 years after the previous major mall was built in Canada. The developer, Ivanhoe Cambridge, has plans to develop at least three other similar large malls in other Canadian markets over the coming years.

In Canada, the shopping centre industry has not abandoned the mall format, although it has altered it to maintain its appeal to Canadian consumers.

Evolution of retail development in the Greater Toronto Area, 1996–2005

This section of the report examines the spatial evolution of retail commercial development across the Greater Toronto Area between 1996 and 2005. The analysis draws on methods from the branch of geographical statistics concerned with the analysis of patterns of events (e.g., disease, crime, development). Geographical statistics are applied here to study commercial development processes that have led to the development, over time, of retail destinations distributed across the GTA.

The data for this analysis were taken from the CSCA databases, which contain retail location data for the GTA organized by opening year. This provided us with 10 sets of retail location distributions (one set of retail location distributions for each year between 1996 and 2005) for each of the following retail formats:

- community and neighbourhood shopping;
- enclosed regional and super-regional malls;
- retail power centres.

This created a total of 30 maps, showing the distribution of each format by opening year, for each of the 10 years (**Figures 7 through 9**).

The method used to create the maps, which involved the local smoothing of retail square footage surveyed at each retail location for a particular year, is described in detail in the **Appendix**. The process produced a time series of retail maps showing regional trends in the intensity of retail development. Areas characterized by a greater intensity of retail development are shown in red and yellow. The maps illustrate the spatially uneven growth and geographical clustering of retail capacity (measured in retail square feet) across the GTA.

The initial evidence suggests that retail activities develop in a non-uniform manner across space. While this finding is expected, given constraints such as zoning and changes in market forces, the maps indicate the regional subareas that host larger shares of specific types of retail.

In **Figures 7 and 8**, we see that community and neighbourhood shopping (usually in the form of small unenclosed malls and plazas with parking in front) and the enclosed regional and super-regional malls tend to cluster in the historic urban centre of the Greater Toronto Area, with the intensity of this sort of development tapering off toward the limits of the inner suburbs (e.g., the edge of the City of Toronto boundary). By comparison, **Figure 9** shows that power centres are a suburban phenomenon. Moreover, the maps indicate that the development of the various retail formats has ebbed and flowed over the 10-year period. For example, while power centre development accelerated during the 10-year period, very little change occurred in shopping centre development.

Across the GTA, the growth of retail capacity is spatially uneven and geographically clustered. Certain regional subareas host larger shares of specific types of retail than others.

In the past 10 years, there is evidence of increasing retail development in downtown Toronto and to the east and west of downtown, reflecting both infill and the growing consumer markets within the inner suburbs.

The only major mall developed in Canada since 1989 has been Vaughan Mills to the northwest of Toronto, less than 5 kilometres away from the largest power node in the GTA.

Figure 7: Community and neighbourhood shopping (units are '00s of retail sq. ft.)

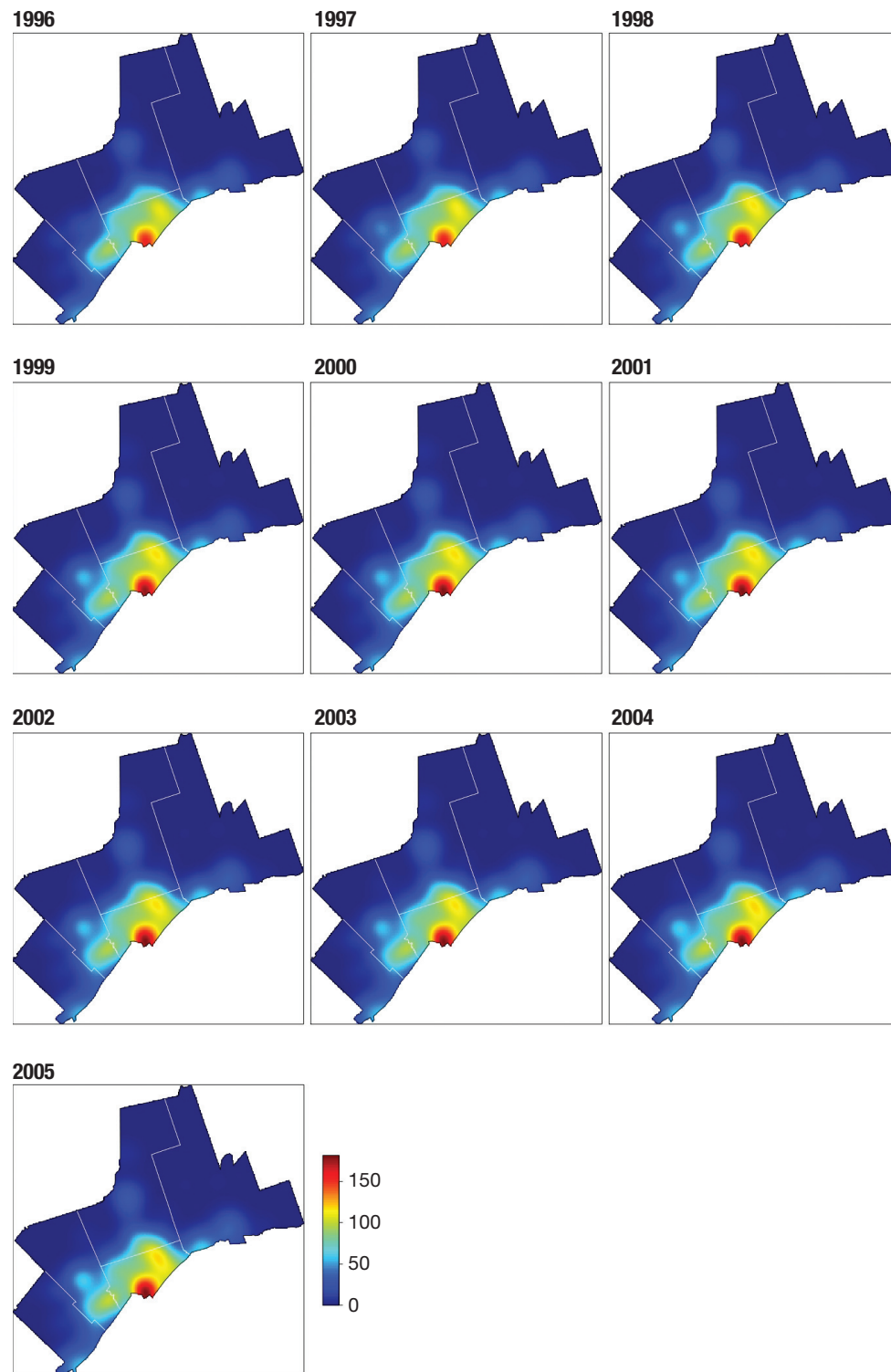


Figure 8: Enclosed regional and super-regional centres (units are '00s of retail sq. ft.)

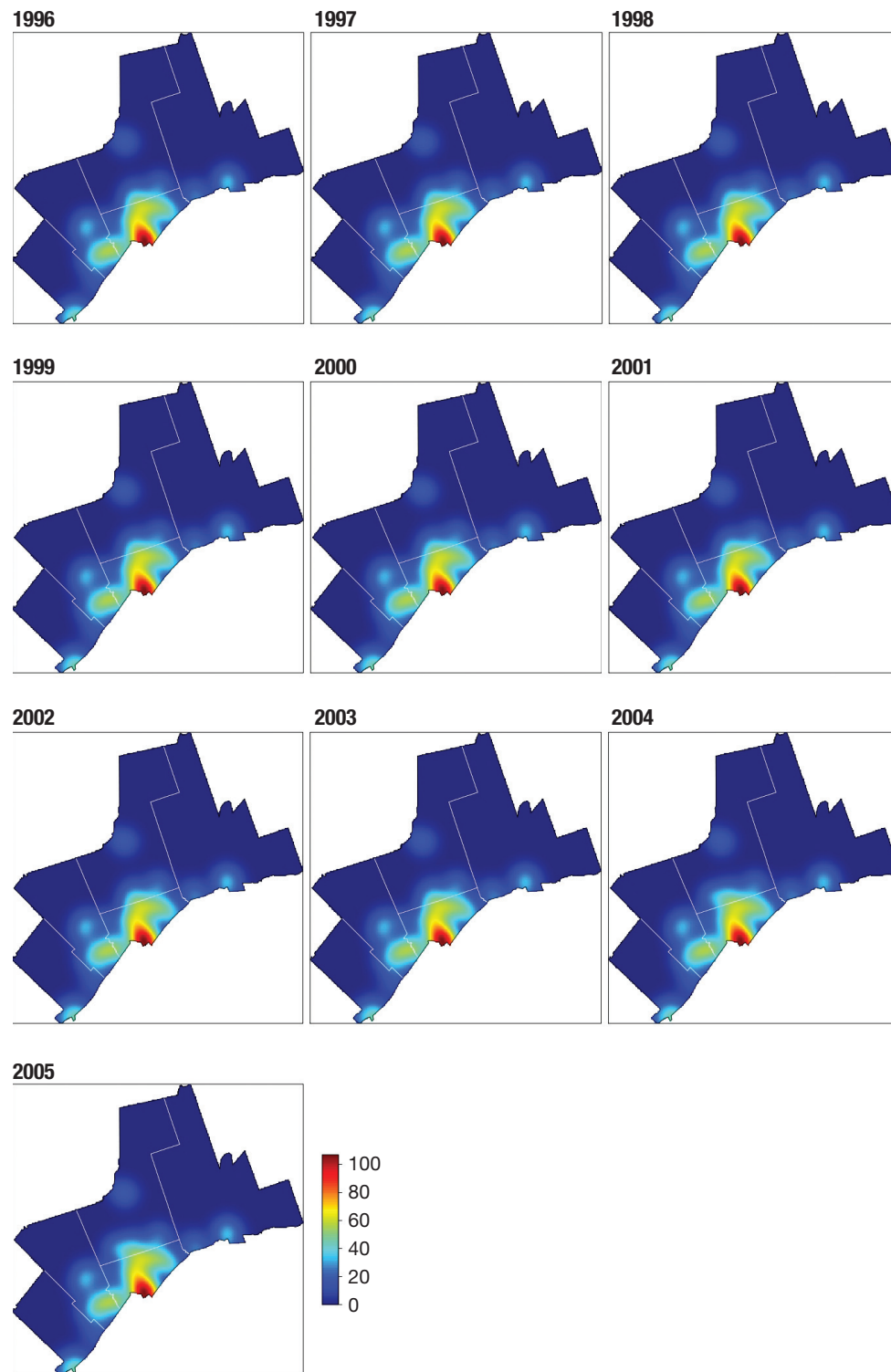
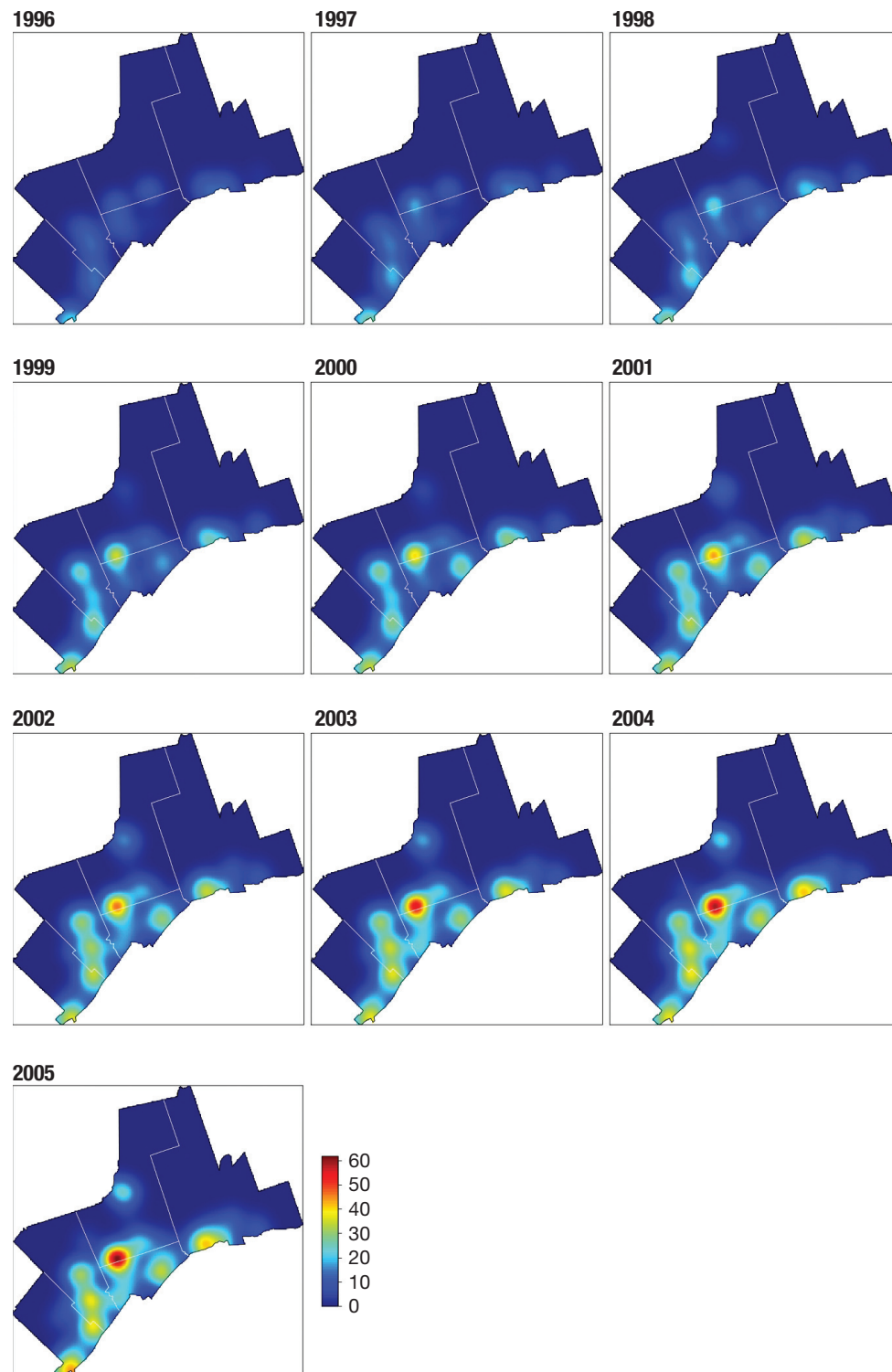


Figure 9: Power retailing (units are '00s of retail sq. ft.)



The pattern of community and neighbourhood shopping reflects the commercial legacy of the 1960s to the 1980s. In addition, over the 10-year period, there is evidence of increasing retail development in downtown Toronto and to the east and west of downtown, reflecting both infill and the growing consumer markets within the inner suburbs (Scarborough, Etobicoke, East York), and outer suburbs (Mississauga). The maps also reflect developing food- and pharmacy-anchored centres in the new subdivision growth areas of the GTA.

The intensity of community and neighbourhood retailing in the core is an interesting phenomenon. The patterns reflect the constraints of local planning and zoning regulations and suggest that the reproduction and outward expansion of retail formats suited to the mix of traditional and high-density neighbourhoods served by a dense transit network within the historic core is limited.

The 15-year hiatus in the development of enclosed malls is apparent in **Figure 8**, which shows that little change has occurred in the intensity of enclosed mall development across the 10-year period. The only major mall developed in Canada since 1989 has been Vaughan Mills to the northwest of Toronto, less than 5 kilometres away from the largest power node in the GTA. These two locations, along with some ancillary retail opportunities, offer more than 5 million square feet of retail space. Between 1989 and 2004, however, the CSCA databases indicate that about 90 million sq. ft. of power retail development was built across Canada.

The power retail era

The GTA has experienced rapid growth in the number of big-box-format retailers since 1996; by 2005, the number of big-box stores had doubled to more than 1,100, totalling an estimated 42 million sq. ft. of retail space. The development of big boxes has largely been clustered into power centre and power node developments.

Table 3 indicates the widespread development of power centres in the GTA. As **Figure 9** shows, this growth in power retail capacity has not occurred evenly over space. Early inner-suburban expansion of capacity in Toronto has yielded to the intensification of power retailing in the suburban GTA, and infill development in the inner urban area. This trend clearly contrasts with the concentration of shopping centre and traditional retailing primarily within the historic urban core and the inner suburbs. The largest concentration of power retailing in the region has been built around the junction at the intersection of Highway 400 and Highway 7, to the north of the City of Toronto. This sort of development indicates the importance of accessibility by automobile associated with “remote” parcels located near infrastructure constructed during Canada’s era of highway expansion (1950s and 1960s). Land owners and developers make the most of this accessibility advantage (i.e., the ability to reach markets and attract consumers who drive cars) provided by public infrastructure, drawing consumers from both newly developed suburban and exurban residential areas, and from elsewhere across the region.

Land owners and developers make the most of the accessibility advantage provided by public infrastructure (highways), drawing consumers from across the region.

Retailing and Growth Boundaries

Considerable debate has taken place over the last several decades over the appropriate way to manage the expansion (or sprawl) of urban areas. Driving this debate are concerns surrounding the loss of agricultural land to urban uses (Kline and Alig, 1999; Statistics Canada, 2006) and the recognition of problems such as traffic congestion, deteriorating air quality, and economic polarization associated with the spread of suburbs that depend on mobility by automobile.

One of the primary but most contested approaches to managing urban expansion in North America is the creation of urban growth boundaries. While growth boundaries have been used in the United States for decades by state governments to regulate urban development (Caruthers, 2002), they are much less common in Canada. The Greenbelt, established in 2005 within the Greater Golden Horseshoe, is an example of a Canadian growth boundary.

One of the most contested approaches to managing urban expansion in North America is the creation of urban growth boundaries. Ontario's Greenbelt, established in 2005, is an example of a Canadian growth boundary.

The success of growth boundaries can depend on political, economic, and structural or design considerations, whereby the structural elements may be the outcome of political and economic forces and actions. Structural considerations include (1) the shape, size, and configuration of the boundary and (2) the organization of land uses and transportation systems within and beyond the boundary. Development within growth boundaries is often directed toward transportation corridors or designated urban growth centres (see Filion, 2001, 2007).

Growth boundaries are controversial because of their effects on development. These effects can include increases in the prices of commercial and residential real estate (Phillips and Goodstein, 2000; Gibson and Abbott, 2002), the “leapfrogging” of development into the exurban spaces beyond the boundary (Heim, 2001; Caruthers, 2002), or the “leaking” of development into grandfathered lots or spaces deemed to have little value for agriculture or other uses (Porter, 1997). Within the boundaries, researchers have questioned whether growth and development will occur as planned in nodes and along transport corridors (Filion, 2007).

The retail patterns and trends we have described raise the question of how large-format retailers will respond to potential rises in land prices in the space between the urbanized area of the Greater Golden Horseshoe and the Greenbelt (**Figure 10**). Several scenarios are conceivable. For example, retail “leapfrogging” could occur, either leading or following residential development.

Figure 11 indicates the share of power centres and enclosed regional and super-regional malls within 25 kilometres of the Greenbelt for 1996 and 2005.⁷ Since

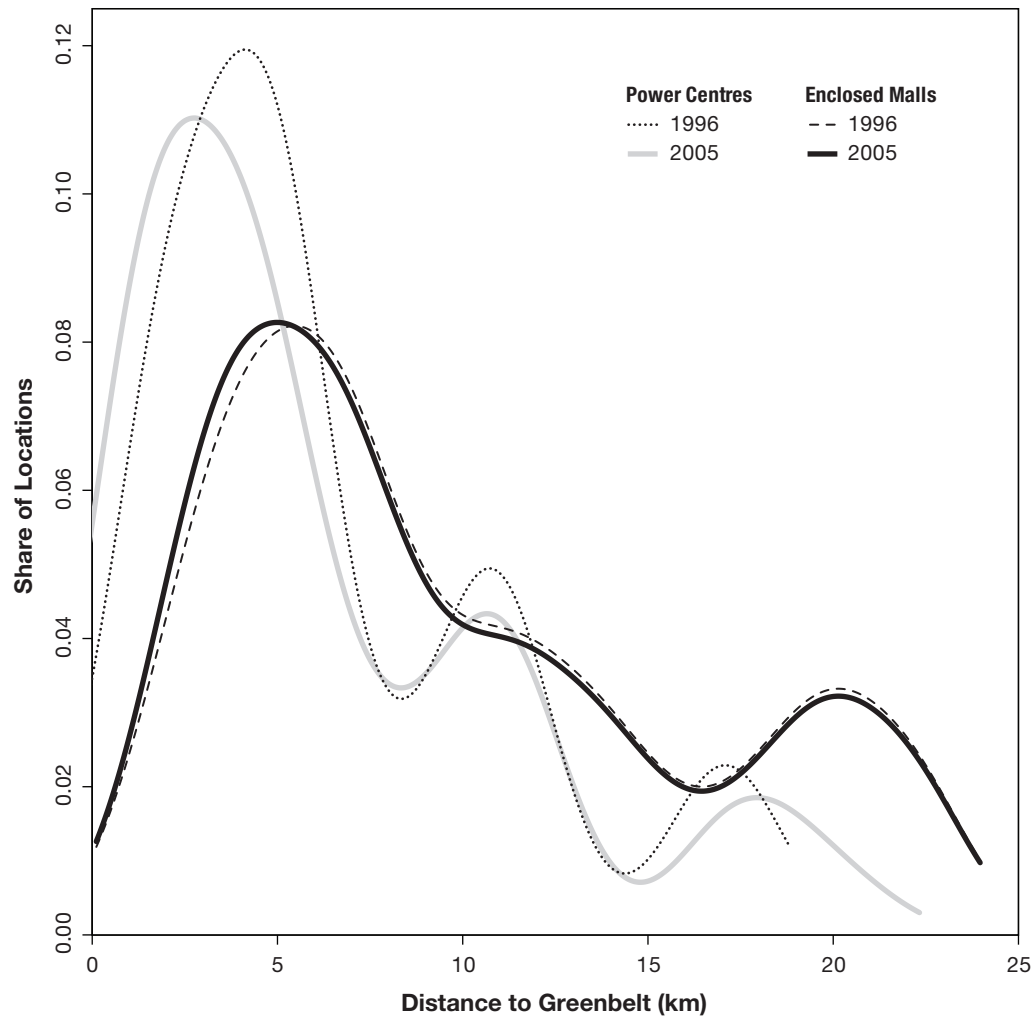
7 The figure can be interpreted as a “smooth” histogram. The peaks and valleys in the lines indicate distances from the Greenbelt at which there are a larger or smaller number of retail locations in relation to the total number of retail locations in the study area for each time period. Distance to the Greenbelt is measured as the straight-line distance between each retail location and the nearest point on the Greenbelt boundary.

Figure 10: Greenbelt and Distribution of Power Centres (2005)

the Greenbelt was only recently established (2005), these data provide additional insight into retail centralization and decentralization within the GTA. The change in the slope of the curve representing power centres between 1996 and 2005 within the 0-to-5-kilometre range signifies an increase in the share of power centres located close to the Greenbelt, at the outer edge of the urbanized area. The overall decline in the share of power centres away from the Greenbelt also reflects the clear suburban focus of power centre retailing.

The marginal shift in the peak of the enclosed mall curve toward the Greenbelt in 2005 indicates the recent construction of Vaughan Mills. Moreover, the peaks for enclosed malls are not the same as those for power retail, since the two kinds of shopping formats occupy different spaces and compete within the regional market.

Figure 11: Distribution of Power Centres and Enclosed Malls by distance to the nearest point on the Greenbelt (1996 and 2005)



The graph also suggests that although power retail development has largely been a suburban activity, it is not a uniform process of continuous sprawl into suburban and exurban locations. The picture is further complicated by recent trends, whereby power retail has moved into traditional downtowns, along major arterials. For example, Best Buy and Canadian Tire have co-located at the corner of Bay and Dundas in downtown Toronto (see Buliung et al., 2007; Nuttall-Smith and York, 2007), while Canadian Tire opened a large-format store on Lakeshore Boulevard close to the waterfront in Toronto's east end.⁸

Power retail development is not a uniform process of continuous sprawl into suburban and exurban locations. Recently, power retail has moved into traditional downtowns, along major arterials.

⁸ Further expansion of big-box capacity north of Lakeshore Boulevard in Leslieville, however, has been heavily contested recently (see nobigbox.ca; Rusk, 2008). Citing the city's designation of the Leslieville site as industrial use or employment lands, the Ontario Municipal Board in March 2009 ended a five-year-long debate by ruling against the proposed development of a 600,000-sq.-ft. retail space with 1,800 parking spaces.

Driven to Shop: Power Retail and Consumer Mobility

Decades of transportation research and recent policy efforts (e.g., MPIR, 2006) aimed at understanding and shaping the relationship between travel demand and urban development have focused largely on the journey to work.⁹ While there are compelling reasons for focusing on commuting,¹⁰ less attention has been given to the relationship between retail trends and consumer travel demand. This omission is remarkable, given the mounting evidence of rising levels of travel for non-work activities (Gordon et al., 1988; USDOT FHWA, 1995; Handy et al., 2002; USDOT BTS, 2006).¹¹ Data from the United States indicate that trips for “family and personal business” (which includes shopping) account for 45 percent of daily trips, while work and work-related trips account for only 18 percent of daily trips (USDOT BTS, 2003). Other evidence suggests that non-work travel represents as much as 75 percent of all trips in urban areas (Bhat, 1998).

Non-work travel represents as much as 75 percent of all trips in urban areas, and data from the Transportation Tomorrow Survey indicate that since 1986, this type of travel has increased at a faster rate than travel to or from work or school.

Within the GTA, data from the Transportation Tomorrow Survey indicate that since 1986, discretionary trip-making has increased at a faster rate than travel for work or school purposes (JPT, 2005). These findings offer compelling reasons for investigating consumer travel for shopping purposes, with a view to advancing policy aimed at reducing road congestion and other problems associated with automobile use. Critical thinking about the impact of retail on environmental, economic, and social systems should, however, be balanced by an acknowledgement of the integral role of retailing in sustaining household, local, and regional economies.

This section examines three questions associated with consumer transportation and shopping across the power retail and enclosed mall formats available within the Greater Toronto Area:

- *When* are consumers travelling for shopping purposes to traffic zones containing power retail or enclosed regional or super regional malls?
- When consumers travel to traffic zones containing power retail or enclosed regional or super regional malls, *how* are they getting there (e.g., auto-driver, transit, etc.)?

9 In academic circles, considerable effort has been made to understand consumer travel for shopping, particularly throughout the 1990s, but most studies have focused on commuting.

10 For example, the capacity of the passenger transport system is particularly “stressed” during periods of peak travel. Moreover, during the journey to work a large share of the population arguably experiences the most challenging conditions within which to operate a personal vehicle. In other words, the commuter’s experience with the problems of personal transport during peak hours focuses the public’s attention on resolving the tension between economic productivity and vehicular congestion.

11 Despite evidence of the increasing role of discretionary activities in everyday life relative to the commute, much of the focus in regional or national reporting of travel behaviour remains focused on commuting, and it is surprisingly difficult to isolate “shopping” behaviours from the remaining trip purposes (see for example, USDOT BTS, 2006).

- *What is the pattern of consumer travel demand for shopping within traffic zones containing power retail or enclosed regional or super-regional malls?*

The responses can only describe, rather than explain, the changing and current state of consumer travel to traffic zones containing power retail locations and enclosed malls within the Greater Toronto Area.

We begin with a literature review of recent evidence on the transformative impact of power retail on consumer mobility, followed by a study of consumer flows for power retail and enclosed mall shopping within the Greater Toronto Area. The section concludes with a discussion of the implications of the findings for regional transportation and growth management planning and policy.

What does the literature tell us?

Power retailing has evolved over the last decade (Hernandez et al., 2003). Power centres and nodes are found in a variety of locations, including new-development urban fringe areas, former industrial areas, and shopping malls, and take a number of forms. The initial “category-killing” attraction of early big-box stores has, in many locations, been complemented with opportunities for cross-shopping and comparison shopping, and smaller-scale services. The emphasis on convenience, price, accessibility by automobile, the minimization of land costs (see Jones and Doucet, 2000), and the “open environment” characteristic of big-box clusters has changed the way in which consumers move around the shopping destination once they arrive.

The “open environment” characteristic of big-box clusters has changed the way in which consumers move around the shopping destination once they arrive.

Traditionally, the enclosed shopping mall provided the shopper with a safe haven, protected from the weather, with an array of additional services (e.g., washrooms, seating, security, etc.). In contrast, power retail provides very few of these amenities, leaving the shopper at the mercy of the elements.

Enclosed shopping malls were also developed to encourage pedestrian movement through the mall. Anchor stores at either end increased the opportunities for cross-shopping at the stores in between. Moreover, the enclosed malls of the 1970s and 1980s were integrated with municipal transit systems. Indeed, the supply of transit was integral to the development of early large-scale shopping destinations across North America (e.g., Bartlett, 2003). In contrast, the typical power centre has been developed with little attention to pedestrian movement within the centre or to pedestrian connections with its surroundings, including access to transit. Discussions of transport relative to power retailing typically focus on site issues (e.g., congestion at intersections), with little attention given to regional transportation impacts or consumer mobility by transit, let alone on foot or by bicycle.

The typical power centre has been developed with little attention to pedestrian movement within the centre or to pedestrian connections with its surroundings, including access to transit.

Power retail establishments are structurally and operationally distinct from other retail formats, lacking, for example, the common spaces and extra amenities of the traditional enclosed shopping centre (Lord and Bodkin, 1996; Bodkin and

Lord, 1997; Wang et al., 2000; Lorch, 2005). Moreover, in contrast to the limited opportunities for the expansion of enclosed malls, power centres may continue to grow through infill development and expansion into surrounding land parcels. The ongoing expansion of large-format retail capacity makes it difficult to develop medium- or long-term plans to balance economic growth with problems such as traffic congestion. That is, the local impacts of power retail can, over time and with expansion, intensify and potentially extend to the regional scale.

The ongoing expansion of large-format retail capacity makes it difficult to develop medium- or long-term plans to balance economic growth with problems such as traffic congestion.

Consumer spatial behaviour also varies across retail formats. For example, recent evidence suggests that between one-half and two-thirds of consumers visit two or more stores in a single trip to a power centre (e.g., Lord and Bodkin, 1996; Lorch, 2005), but this is fewer than the number of stores that consumers visit when they go to a typical regional mall. These findings suggest that consumers tend to focus on a specific store within a power centre, limiting their movement within the centre. This tendency can be reinforced by the layout of the centre, the distance between stores, and the nature of the other available retail opportunities (e.g., store compatibility, tenant mix, size of stores). The distance between stores, for example, reduces cross-shopping within power centres (Bodkin and Lord, 1997).

While little research has been done on consumer travel to power centres, the configuration of power centres and nodes suggests that most consumers drive to them. This is not unexpected, given that the centres are designed for automobile access and sited on less expensive parcels of land on the urban fringe, typically close to highway infrastructure (Jones and Doucet, 2000), and given consumer preference for convenience and low prices (Davies and Clark, 1994).

Lorch (2005) reported that for the Kenaston Power Node in Winnipeg, cross-shopping within the node appeared to take place largely by car — that is, 90 per cent of those who visited two or more stores re-parked their car more than once during a single shopping trip. In fact, one-third of the respondents in the survey reported parking three or more times during the course of a single shopping trip. All the respondents had travelled to Kenaston Power Node by car.¹² In other words, power retail is characterized by high levels of auto use for the initial trip to the centre and additional driving and parking on-site.

Despite the lack of common-area services, the sheer scale and cumulative retail impact of power centres, especially the larger power nodes, means that many of them draw consumers over large distances. Studies have shown that power retail trade areas are often larger than the trade areas of regional malls (Bodkin and Lord, 1997; Wang et al., 2000). This finding suggests that consumers may be trading greater transport costs against the convenience and price advantage of power retail, as an alternative to shopping closer to home at smaller retail outlets or older enclosed malls (where they exist). Other research has shown that the initial regional draw of power centres decreases over time. Once a power centre

Although power retail trade areas are often larger than the trade areas of regional malls, research has shown that the initial regional draw of power centres decreases over time.

12 Ridesharing was not reported, so the extent of single-occupancy vehicle travel is unclear.

is established, it may draw a larger share of consumers who travel shorter distances, typically by car, as residential development fills in around the power centre (Buliung et al., 2007).

The role of power retail destinations in the everyday life of consumers even appears to extend beyond shopping. For example, Wang et al. (2000) found that power nodes may also act as regional entertainment destinations. If this is the case, then the usual justification for the need to provide good automobile access to power retail — so that consumers can take home large quantities of bulky goods — should be modified to take into account the broad range of activities conducted at these locations.

Power nodes may act as regional entertainment destinations, which removes the usual justification for automobile access — so that consumers can take home large quantities of bulky goods.

When do we shop, and how do we get there?

The following description of consumer travel uses cross-sectional travel survey data from the 1996 and 2001 Transportation Tomorrow Survey (TTS). These data have been combined with information from the CSCA retail databases on the geographical distribution of power retail and enclosed mall destinations in 1996 and 2001. The method involved matching TTS trip-ends (identified by traffic zone) with the location of retail opportunities extracted from the CSCA databases. Exploratory analysis confirms that the dominant retail feature within traffic zones visited for shopping purposes is either a retail power centre or enclosed mall (Mitchell, 2006). Estimates of vehicle kilometres travelled (VKT) have been developed by multiplying the number of auto-driver trips (single-occupancy vehicle, or SOV, trips) between a trip origin location and a zone containing retail, along the shortest path connecting the two zones.¹³ The cost (impedance) factor for the shortest-path analysis assumes free-flow conditions under the posted speed limit.¹⁴

Shopping in time and time for shopping

The performance of the transportation system, with respect to the efficient movement of consumers for daily activities, is affected by short- and long-term individual and household decisions on:

- where to go (destination choice);
- when to go there;
- how to get to the destination (mode and route choice);
- when to leave one location for another destination;
- whom to travel with —

13 1 vehicle kilometre travelled = 1 vehicle × 1 km of travel. In the TTS, an auto-driver trip is equivalent to a single occupancy vehicle trip (SOV), or the movement of a single vehicle. In other words, 1 auto-driver trip is equivalent to the movement of 1 vehicle.

14 For a discussion of the role of congestion in this context, see Buliung et al. (2007).

and, over the long term —

- where to live;
- where to work;
- household structure (e.g., marital and family status, household size).

In other words, the daily trip-chains made by individuals, at the aggregate level, contribute to region-wide travel patterns and their implications for traffic congestion, air quality, and so forth. The focus of research and policy on the journey to work, however, leaves a gap in our understanding of the interplay between the use of road infrastructure for shopping, relative to its use for work trips. If, for example, shoppers and workers are competing for the same roads at the same times, then policy directed at shaping the demand for passenger transport should broaden its focus to include the relative or simultaneous timing, or chaining together of these activities.¹⁵

The following description of consumer travel to power retail and enclosed malls during a typical weekday in the fall stresses auto-driver (single-occupancy-vehicle) trips. The differences between shopping rates on weekdays and on weekends cannot be examined using the TTS. Research also suggests the presence of some variation in shopping across weekdays (Kahn and Schmittlein, 1989). The results of this study will, however, provide a profile of typical weekday travel to power retail and enclosed malls. Moreover, recent research suggesting that a person who owns a car will use it for all travel — particularly if that person lives in a “suburban-style” setting (see Turcotte, 2008) — provides sufficient rationale for studying peak periods in power retail shopping travel across the region.

The “peaking” of consumer travel for power retail and enclosed mall shopping across the GTA is demonstrated here by plotting the distribution of trip start-times for trips originating from home (**Figure 12**) and trips from all origins (**Figure 13**). Shopping trips have been disaggregated further by mode (all modes vs. auto driver mode), retail format at the destination (power centre vs. enclosed mall) and trip purpose (work or work-related vs. shopping). The work-travel observations have been adjusted downward by a factor of 10 to facilitate visual comparison of the results (since peak-period work trips vastly exceed shopping trips). Differences between the results for work trips and shopping trips are likely exaggerated due to the underreporting of discretionary trips in the TTS.

Several observations can be drawn from the trip time distributions for shopping trips starting from home.

- The a.m. and p.m. peak periods in shopping travel typically occur outside the peak periods of travel for work or work-related purposes. These shopping peak periods

In 2001, travel to power retail peaked in mid-morning, early afternoon, and early evening.

15 Of course, some people are at certain times simultaneously “shoppers” and “workers” — i.e., individuals who participate in both activities while travelling, at either end of the work trip, or at some point during the trip.

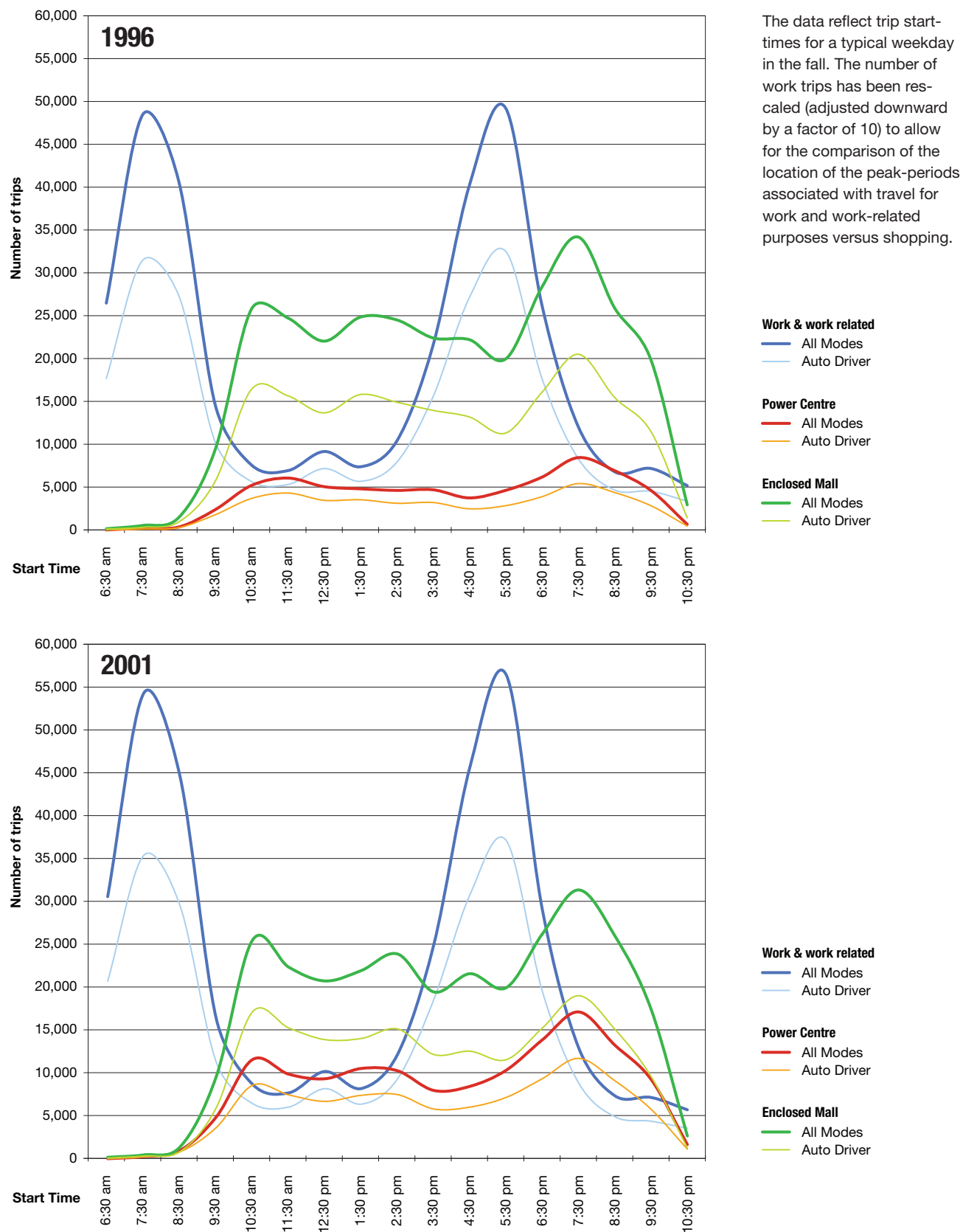
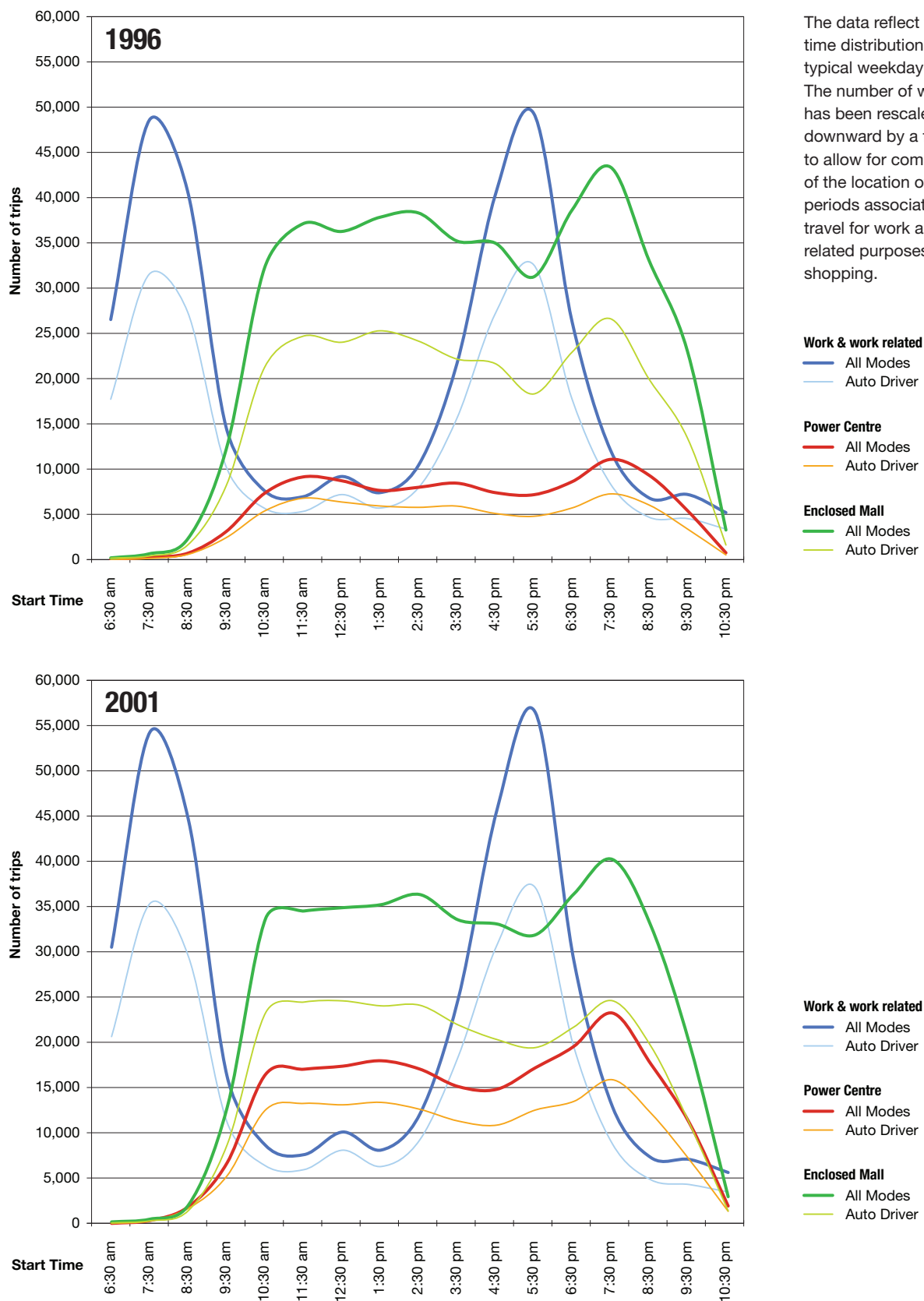
Figure 12: Trip start-time distributions for trips from home to enclosed malls or power retail in the GTA: 1996 and 2001

Figure 13: Trip start-time distributions for trips from all origins to enclosed malls or power retail in the GTA: 1996 and 2001

The data reflect trip start-time distributions for a typical weekday in the fall. The number of work trips has been rescaled (adjusted downward by a factor of 10) to allow for comparisons of the location of the peak periods associated with travel for work and work-related purposes versus shopping.

occur in mid-morning (10:00–11:30 a.m.), mid-afternoon (1:00–3:00 p.m.), and early evening (7:00–9:00 p.m.).

- In 1996, travel to zones with power retail peaked at 11:30 a.m. (71 percent auto-driver) and 7:30 p.m. (64 percent auto-driver). In 2001, travel to power retail peaked at 10:30 a.m. (74 percent auto-driver), 1:30 p.m. (70 percent auto-driver), and 7:30 p.m. (68 percent auto-driver).
- In 1996, travel to enclosed malls peaked at 10:30 a.m. (64 percent auto-driver), 1:30 p.m. (64 percent auto-driver), and 7:30 p.m. (60 percent auto-driver). In 2001, travel to enclosed malls peaked at 10:30 a.m. (68 percent auto-driver), 2:30 p.m. (63 percent auto-driver), and 7:30 p.m. (61 percent auto-driver). There was also evidence in 2001 of a mini-peak at 4:30 p.m. (58 percent auto-driver).
- While most trips to enclosed malls are taken by car, when compared with the power centre curves, the gap between “All modes” and “Auto Driver” indicates greater use of other modes (e.g., transit, auto-passenger, etc.).
- Most weekday shopping trips, to either format, occur after the afternoon peak commuting period.

Examining these processes without further disaggregation by origin (i.e., trips originating from home or from another location) provides additional insight into the timing of consumer-retail interactions in the study area.

- Overall, there appears to be a relatively sustained level of shopping activity throughout the day.
- The a.m. and p.m. peak periods in shopping travel typically occur outside peak periods of travel for work or work-related purposes. These periods can be characterized as mid-morning (10:00–11:30 a.m.), mid-afternoon (12:30–3:00 p.m.), and post-work evening (7:00–9:00 p.m.).
- In 1996, peak period travel to zones with power retail occurred at 11:30 a.m. (74 percent auto-driver) and 7:30 p.m. (65 percent auto-driver). In 2001, peak period travel to power retail occurred at 11:30 a.m. (76 percent auto-driver); 1:30 p.m. (75 percent auto-driver); and 7:30 p.m. (68 percent auto-driver).
- In 1996, peak period travel to enclosed malls occurred at 11:30 a.m. (66 percent auto-driver); 2:30 p.m. (63 percent auto-driver); and 7:30 p.m. (61 percent auto-driver). In 2001, peak period travel to enclosed malls occurred at 11:30 a.m. (79 percent auto-driver); 2:30 p.m. (66 percent auto-driver); and 7:30 p.m. (61 percent auto-driver).

- Beginning at around 9:00 a.m., there appears to be a rising and then sustained level of shopping activity throughout the day, that starts to decline at around 8:00 p.m. An increase in shopping during the post-work evening peak period is evident.
- For all times of day, more trips end at zones containing enclosed malls than in zones containing retail power centres.
- The timing of shopping trips to power centres or enclosed malls appears similar. However, there is some evidence of a more sustained peak period in power retail shopping in comparison with the peak in shopping trips to zones with enclosed malls.

The timing of shopping travel described above gives rise to four key observations.

First, there is evidence of increasing automobile use for shopping in all peak periods and for both retail formats. The only exception to this rise in automobile use appears to be the p.m. peak for enclosed malls (61 percent of trips in 1996 and 2001). The data suggest that the largest change in automobile use occurred during the a.m. peak for enclosed malls (66 percent to 79 percent auto-driver). Evidence for rising levels of automobile use suggest that the proliferation of the auto-dependent power retail format is being matched with an increase in automobile use for travel to enclosed malls.

Second, more automobile trips are taken to enclosed malls throughout the day than to retail power centres. The enclosed mall has retained an important role in weekday shopping and the automobile is the primary mode of travel to these locations, despite the differences in the supply of transport alternatives that may partially distinguish the enclosed mall from power retail. In 2001, for example, auto-driver and passenger trips accounted for 88 percent of trips from home to zones with enclosed malls, while transit captured roughly 11 percent of these trips.¹⁶ In contrast, auto-driver and auto-passenger travel to power centres during the same time period captured 96 percent of the market.

Differences in automobile use across format types are to be expected, given the way in which power centres are laid out and their lack of pedestrian facilities. Moreover, it is important to consider the historical record. The first wave of suburban retail in the GTA was developed with transit in mind (early super-regional suburban malls were developed in the City of Toronto with direct links to transit), and indeed, the availability of transit was an integral component of the development of most early large-scale shopping destinations across North America (e.g.,

If shoppers and workers are competing for the same roads at the same times, policy-making for sustainable transportation systems should include the simultaneous timing or chaining together of these activities.

16 The unevenness of this process over space is acknowledged. For example, in 2001 transit captured roughly 69% of the market for consumer travel to the TTS zone containing the Toronto Eaton Centre. Moreover, variation in trip rates by mode is expected due to differences in consumer tastes and preferences, and the available supply of transit options across space.

Bartlett, 2003). Developers of more recent, much larger retail locations, however, typically cater to consumers who arrive by automobile.

Third, the data indicate some changes in the scheduling of shopping trips between 1996 and 2001. The peak in power retail shopping trips starting from home has shifted from 11:30 a.m. in 1996, to 10:30 a.m. in 2001. Moreover, by 2001 the mid-afternoon peak in shopping trips to zones with enclosed malls was partly matched by the emergence of a mid-afternoon peak in power retail travel.

Fourth, the p.m. period overlap of the work and shopping trip start-time distributions shown in **Figures 12** and **13** indicates greater competition for road capacity across work and shopping trips in the p.m. period than during the a.m. peak period in commuting. While it is obviously not possible in this analysis to identify the specific places in the passenger transportation system where the greatest competition for road space occurs, there is more activity within the transportation system during the afternoon peak period (for shopping, work, and the movement of goods), which may produce higher levels of congestion and longer travel times.

The qualities of convenience, price, and auto-oriented accessibility (e.g., Jones and Doucet, 2000) of power retail appear to be prompting a consumer response in the timing of shopping trips. While there is some overlap in the trip start-time distributions, GTA consumers appear to organize most shopping trips outside the peak periods of work-related travel, thereby partially avoiding the most congested times of day on the GTA's roads. The demand for shopping may be more sensitive to trip duration; consumers may respond by scheduling shopping, particular discretionary shopping trips, at periods of the day when congestion is lower. Moreover, hours of work constrain the scheduling of weekday shopping, pushing demand for travel of this sort into the non-work time periods.

Research conducted elsewhere also suggests that people working outside the home are more likely to drive to shopping during the post-work period than others, and that women are more likely to shop during the a.m. and p.m. off-peak times than men (Bhat, 1998). Understanding who is doing the shopping and developing policies to balance the needs and preferences of shoppers against sustainability goals for the region are important directions for future research.

From a planning, policy, and research perspective, it will become increasingly important to broaden current thinking on the determinants, decision processes, and outcomes (e.g., mode choice and externalities) associated with peak periods in shopping travel. Additional research is required to understand how, when, and why consumers in the Greater Golden Horseshoe Area visit enclosed malls and power retail centres and how policies to reduce auto-dependence might be received by different segments of the population, given differences in household responsibilities, labour market participation, and preferences for goods and services.

The enclosed mall has retained an important role in weekday shopping and the automobile is the primary mode of travel to these locations, even though many are accessible by transit.

The afternoon overlap of work and shopping trip start-time distributions indicates competition for road capacity across work and shopping trips in the p.m. peak commuting period.

People working outside the home are more likely than others to drive to shopping after work, and women are more likely than men to shop during off-peak times.

Additionally, and following the amendments to the *Retail Business Holidays Act* in 1992 that permitted Sunday shopping in Ontario, there is a strong case to be made for extending analysis of this sort into the weekend. National-level data suggest that the weekend days of the employed labour force (paid workers 25 years and older) are characterized by peaks in shopping at around 11:00 a.m., with the afternoon and evening given over to leisure activities (Silver and Compton, 2002). Not as much shopping occurs on Sundays as on Saturdays, and the late afternoon peak in Saturday shopping (3:00 p.m. to 3:30 p.m.) does not materialize on Sundays (Silver and Compton, 2002).

While region-wide travel survey data for weekends are not available for the study area, recent analysis of detailed individual-level data for the GTA suggests that the geography of weekend travel demand can be highly variable, and quite different from weekdays (Buliung et al., 2008). The growth of the service economy and the retail sector in particular also means that work, leisure, and shopping travel demand likely compete for road use on weekends. The location of weekend congestion and the development of weekend policies to affect patterns of weekend travel demand require some attention from researchers and practitioners.

Additional research is required to understand how policies to reduce auto-dependence might be received by different segments of the population, given differences in household responsibilities and labour market participation.

Implications for the Growth Plan for the Greater Golden Horseshoe

The revised Provincial Policy Statement of 2005 and the Growth Plan for the Greater Golden Horseshoe (MPIR, 2006), have galvanized debate on growth management in southern Ontario. This study of retail development and consumer travel behaviour for shopping in the GTA serves as a useful regional case study that can shed light on the relationship between the retail system, consumer transportation, and the visions and principles in the Growth Plan.

In this final section of the paper, we examine how the provisions of the Growth Plan for the Greater Golden Horseshoe would affect retail development and compare these provisions with our findings.

Retailing and the Growth Plan

The emphasis in the Growth Plan is on creating complete communities, which accommodate both residents and jobs. Policy 2.2.2.1 articulates that “Population and employment growth will be accommodated by...encouraging cities and towns to develop as *complete communities* with a diverse mix of land uses, a range and mix of employment and housing types, high quality public open space and easy access to local stores and services” (MPIR, 2006, 13).

The Plan also calls for compact communities. *Compact urban form* (MPIR, 2006, 41) is defined as: “A land-use pattern that encourages efficient use of land, walkable neighbourhoods, mixed land uses (residential, retail, workplace and institutional all within one neighbourhood), proximity to transit and reduced need for infrastructure. Compact urban form can include detached and semi-detached houses on small lots as well as townhouses and walk-up apartments, multi-storey commercial developments, and apartments or offices above retail.” (MPIR, 2006, 41).

Taken as a package, the policies of the Growth Plan are intended to promote such complete and compact developments. However, the plan is much more detailed in its targets and intentions for residential development and for employment in the form of offices and manufacturing than it is for retail and services. There is no definition of “major retail” as there is for “major office,” nor a policy for its location—by comparison, “major office and major institutional development” is clearly directed towards Urban Growth Centres. Furthermore, the definition of “employment area” mentions only “clusters of business and economic activities including, but not limited to, manufacturing, warehousing, offices, and *associated retail* and ancillary facilities [emphasis added].” This definition is taken from the 2005 Provincial Policy Statement (PPS) and it is worth noting that it is the only place in the entire PPS where retail or shopping is mentioned.

The Growth Plan for the Greater Golden Horseshoe is much more detailed in its targets and intentions for residential development and for employment in the form of offices and manufacturing than it is for retail and services.

The main policy in the Growth Plan that is relevant to large-format retail concerns the conversion of lands designated for employment uses to non-employment uses (2.2.6.5). Under the Growth Plan, proposed conversions now require a comprehensive review. The plan stipulates that for the purposes of this policy, “major retail uses are considered non-employment uses” (MPIR, 2006, 18). In other words, redesignating employment lands to allow the creation of power retail would require a municipal comprehensive review to ensure that the conversion is compatible with a municipality’s efforts to meet the other requirements of the Growth Plan, including employment forecasts.¹⁷

The Growth Plan contains policies to encourage mixed-use developments, but it does not close off all possible avenues for further big-box development, nor does it apply to developments that were already in the pipeline when it was introduced in 2006.

There are, however, a number of situations in which this policy does not apply. Conversions of employment lands in “downtown and regeneration areas” (these terms are not precisely defined in the Plan, but appear to include central urban areas and brownfields) are required only to meet the much less stringent requirements of the Provincial Policy Statement, section 1.3.2—that is, it must be “demonstrated that the land is not required for employment purposes over the long term and that there is a need for the conversion.”

Furthermore, neither of these policies would apply to a municipality that has already included a provision for retail uses within its designated employment areas. In this sense, the Province has not yet established a level playing field for retail; big-box developers may gravitate to those municipalities where retail is treated as an employment use and allowed as-of-right in employment areas.

To be sure, the Growth Plan sets requirements for the density of greenfield and urban centre development and contains policies to encourage mixed-use developments, but it does not close off all possible avenues for further big-box development, nor does it apply to developments that were already in the pipeline when the Growth Plan was introduced in 2006.

In an effort to resolve questions relating to employment lands, including the conversion of lands in employment areas to large-format retail, in May 2008 the Ministry of Public Infrastructure Renewal issued a paper titled “Planning for Employment in the Greater Golden Horseshoe.” This discussion document invited comment from stakeholders on how to develop “guidelines to support better planning for retail activities... Some of the areas that these guidelines may examine include proactively planning for the appropriate location and design of major format retail, including large-format retail” (MPIR, 2008, 22). Stakeholders were asked to submit comments by July 2008 and the Ministry committed to “work with all parties to elaborate the potential strategies” (p. 40). As of spring 2009, no strategies had been announced, and since municipalities are still largely focused on bringing their official plans into conformity with the existing policies of the Growth Plan, the Ministry has not set a timeline for releasing more detailed retail policies.

17 This policy is backed by changes to the *Planning Act*, which disallow appeals to the Ontario Municipal Board of municipal decisions not to redesignate employment lands for other purposes.

When policies are developed, it is hoped that they will establish clear definitions of retail uses, settle the question of whether retail is a permitted use for employment lands (which will require a shared understanding of the value-added proposition of retail land use and the increasing role of the retail trade and services sector in employing Canadians), and create a region-wide retail policy that will apply uniformly to large-format retail in all municipalities, since power retail is a region-wide concern that affects traffic flows well beyond the borders of any individual municipality.

Only time will tell if the combination of political will and a better understanding of retailing processes can more closely align the consumer economy with the Growth Plan's vision.

Provincial growth policies need to provide clear definitions of retail uses, settle the question of whether retail is a permitted use for employment lands, and create a region-wide retail policy that will apply uniformly to large-format retail in all municipalities, since power retail is a region-wide concern.

Employment Lands and Urban Growth Centres

The intent of the Growth Plan is to direct growth to existing built-up areas and areas of intensification, particularly Urban Growth Centres. The Growth Plan identifies 25 such centres throughout the region. Urban Growth Centres are to serve as “focal areas for investment in institutional and region-wide public services, as well as commercial, recreational, cultural and entertainment centres... [and as] high density major employment centres” (MPIR, 2006, 16).

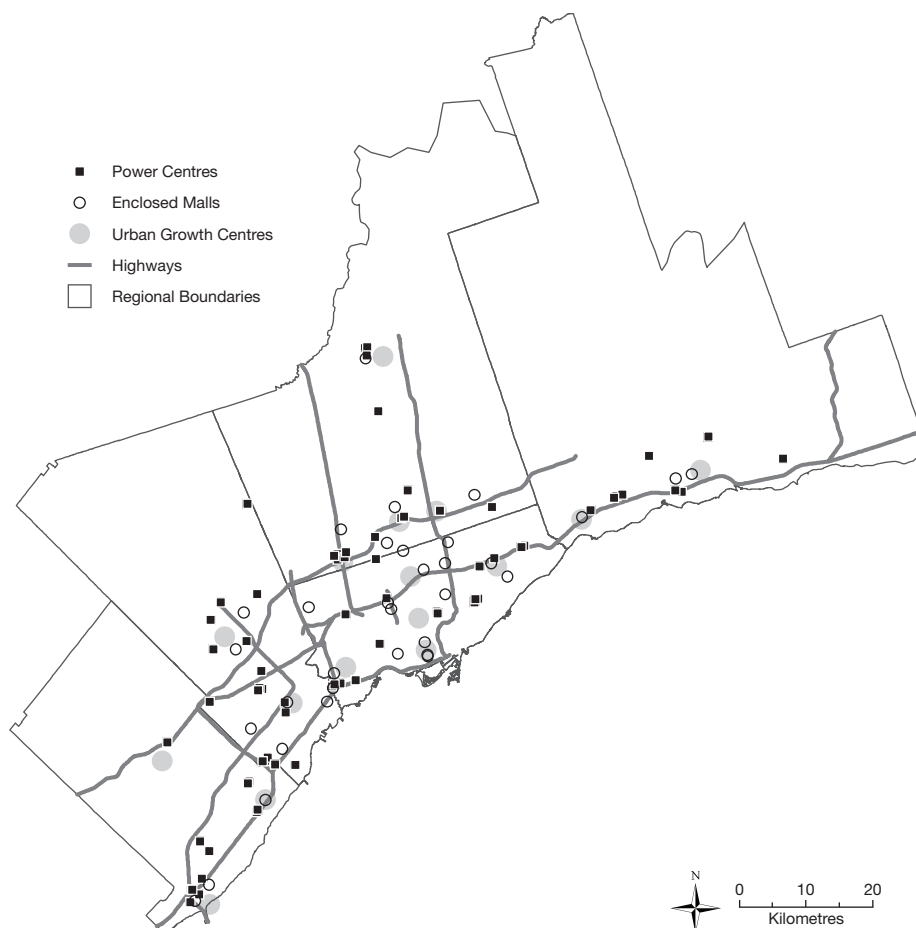
This research compared the locations of these Urban Growth Centres with patterns of consumer travel to TTS zones containing power centres and enclosed malls (**Figures 14 and 15**). It appears that consumer traffic flows to power centres and malls are concentrating a few kilometres away from the planned Urban Growth Centres (**Figure 15**).¹⁸ The data indicate commercial development processes that encourage consumer travel to power centres in the peripheral or “unplanned” gaps of the GTA, close to and generally outside areas designated for intensified development.

Consumer traffic flows to power centres and malls are concentrating a few kilometres away from the planned Urban Growth Centres.

The pattern of trips to power centres is an artefact of both the spatial organization of the Urban Growth Centre network and retail intelligence. That is, several of the Urban Growth Centres, although they have recently developed into cities in their own right, originated as suburban communities (e.g., Mississauga) developed on inexpensive land, with access to the high-capacity facilities within the regional road transportation system.

From a planning and policy perspective, it appears there is work to be done in shaping land use, for commercial purposes, in and around the planned centres, in a way that will advance the region towards its goals of inclusive urban and regional systems where healthy people, living in healthy environments, can make sustainable decisions in the presence of sustainable alternatives. The entrenchment

18 The findings partially reflect the effect of scale on analyses of this sort. The urban growth centres themselves are actually sub-areas of the broader region; the point locations used in policy documents to communicate the location of these centres are typically sited at key intersections.

Figure 14: Places to Grow & Places to Shop

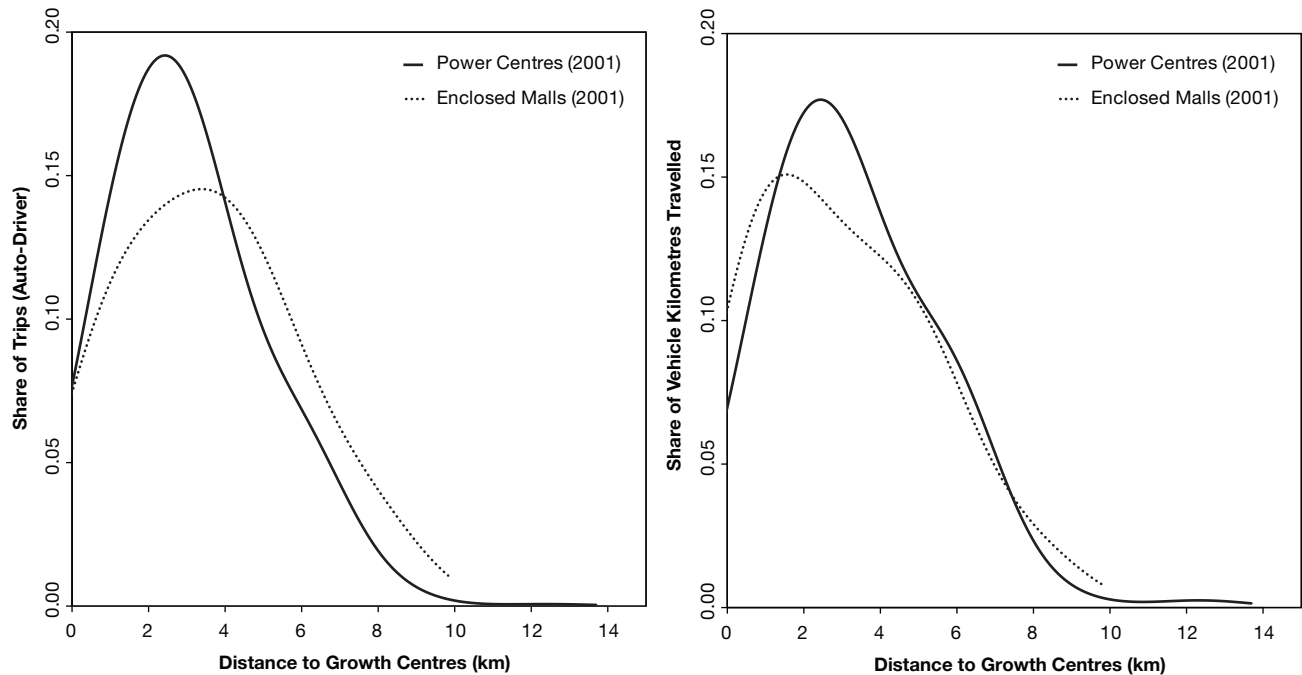
of power retailing, which predated the creation of the Growth Plan, threatens to undermine these goals. And if, as some have argued, the market for power retailing is at or nearing saturation, the task is not to prevent the creation of new power retailing outlets, but to find some way to reconcile existing power centres and power nodes with plans for Urban Growth Centres and with growth management goals more generally.

Highways, Interchanges and Auto-oriented Retail

Growth management strategies often focus on land use patterns. Less attention is given to the ways in which interventions designed to limit the expansion of city-regions affect transportation (Buliung and Kanaroglou, 2006). The past 15 years (the period immediately preceding the release of the Growth Plan) have been characterized by the production of vast spaces for consumption, primarily (but not entirely) located in suburban areas, close to high-capacity roads and highways (see **Figure 16**). These developments have been organized around well-established infrastructure, particularly the roads and highways built since the Second World War.

If the market for power retailing is at or nearing saturation, the task will be to find some way to reconcile existing power centres and power nodes with plans for Urban Growth Centres and with growth management goals more generally.

Figure 15: Distribution of auto-driver shopping trips and VKT relative to the location of the Greater Toronto Area's Urban Growth Centres, as designated in the Growth Plan for the Greater Golden Horseshoe



Note: Peaks in the graph indicate a larger share of trips or VKT at the identified distance from an Urban Growth Centre. The data suggest that power centre trips and VKT tend to be concentrated within 2 to 4 kilometres of the Urban Growth Centres.¹⁹

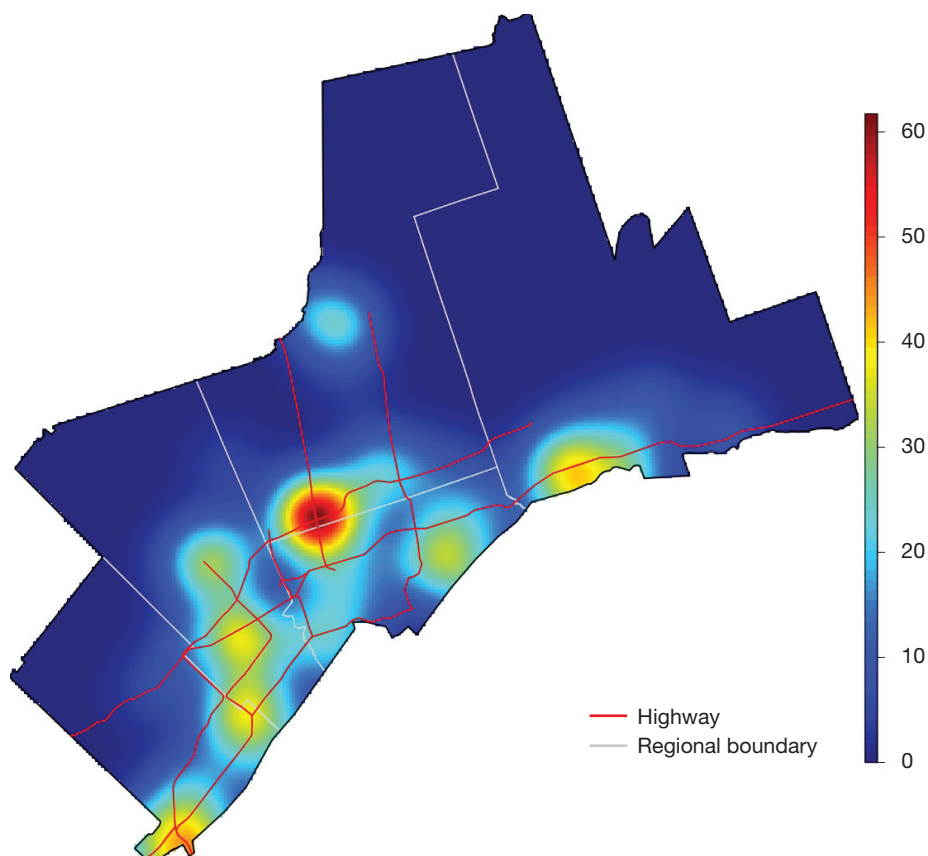
Placing auto-oriented retail and other “destinations” at these locations, improves the “reach” of retailers into the auto-oriented and auto-dependent segments of the market.²⁰ However, this accessibility advantage, which consumers associate with convenience and low retail prices, is incompatible with the design goals of the Growth Plan, which promote the mixing of uses and the placement of sites for everyday activities closer to where people live, work, and play.

The Growth Plan proposes the long-term development of an alternative “value-added” landscape around highway interchanges (as well as ports, rail yards, and airports), a landscape that includes, “areas for manufacturing, warehousing, and associated retail, office and ancillary facilities, where appropriate” (MPIR, 2006,

19 The graphs were developed by combining estimates of vehicle kilometres travelled or trips with measures of proximity used to describe the location of individual retail facilities in relation to the Urban Growth Centres identified through the provincial planning process (Figure 13). The results show the share of either vehicle kilometres travelled or trips (from home to TTS zones with enclosed malls or power centres), by distance to the nearest Urban Growth Centre. The data indicate the share of VKT or trips associated with a particular retail format, focused within and around the proposed Urban Growth Centres.

20 An individual can be auto-oriented (i.e., favouring the automobile) without being auto-dependent. For example, and insofar as neighbourhood density is an acceptable indicator of the potential for “auto-independence,” Turcotte (2008) has shown that fewer than half of residents of urban neighbourhoods take at least one trip per day by car as the driver.

Figure 16: Power retailing ('00s of retail square feet) and the 400-series highways



The gradient fill represents the geographical variation in the intensity (see [Appendix](#)) of retail development across the GTA in 2005. Larger values are indicative of the geographical clustering of retail capacity (sites and retail square footage). Note the concentration of retail capacity surrounding the 400-series highways and highway interchanges.

19, emphasis added). However, since many of these areas already contain power retail and associated parking lots, the opportunity to establish manufacturing or other types of employment use in some of these places may have passed. A land use inventory that documents what is currently in place in these locations is needed to support the Growth Plan's policies in this area.

The on-going expansion of unenclosed power centres at the intersection of major arterials, and around highway interchanges essentially forces consumers to use their cars more, not only to get to these centres, but to also navigate their way around these islands of retail activity surrounded by parking lots. Similarly, recent mall development (i.e., Vaughan Mills) and re-development has added external big-box retailers and services to the periphery of enclosed shopping venues, thereby turning the malls "inside out," and entrenching auto-dependency. Nevertheless, the on-going redevelopment (and re-use) of existing retail locations provide substantial opportunities to encourage more sustainable development, provided that these opportunities can be seized.

The on-going expansion of unenclosed power centres around highway interchanges essentially forces consumers to use their cars more, not only to get to these centres, but to also navigate their way around these islands of retail activity surrounded by parking lots.

A future for power retailing?

At the time of writing, North America and the world have become embroiled in a global economic crisis. Reports from the United States and Canada suggest that consumer spending is in decline. In the midst of this latest economic downturn, longer-term demographic trends are simultaneously reshaping consumer markets, the baby boomers are aging and taking their accumulated wealth along with them into retirement, while they consider the prospect of aging in place or elsewhere.

In the near term, consumers will likely become more and more price-sensitive, and supply chains (including labour) could be placed under stress to maintain and increase the profit margin from retail sales. The impact of the economic downturn will affect different retailers in different ways, given the competitive edge of large-format retailers, and the fact that smaller independents typically have greater difficulty “weathering the storm” (Jones and Doucet, 2000). Canada has seen previous cycles of retail innovation, in which the “old” are replaced by the “new” as markets stabilize. There is no reason to expect that over time, power retail will retain its dominance, particularly within Canada’s suburban markets (Hernandez and Simmons, 2006). The questions remain: what will be the next structural manifestation of price, convenience, and accessibility, and what will be the geography of the next phase of retail innovation?

If recent evidence provides any indication, the future of power retail could include the development of some large-format stores in traditional downtowns (such as Best Buy and Canadian Tire, now located at Dundas and Yonge Streets in downtown Toronto), and the influx of large-format “brands” into smaller commercial spaces along traditional commercial strips (e.g., Sobeys Urban Fresh on Bloor Street in the Annex, and the new Urban Brick location in downtown Toronto) (see Strauss, 2008). Although the implications of this next cycle of retail innovation for the transportation system remain unclear, within the GTA and in Toronto in particular, consumer accessibility to retail in the traditional downtown includes a range of transport options and better integration with public transit.

Large-format development in traditional downtowns is not, however, a foregone conclusion to the process of suburban market saturation. The development of large retail spaces in or at the edge of the traditional downtown can be a risky enterprise — for example, the Ontario Municipal Board recently disallowed the proposed retail redevelopment of the former Toronto Film Studio site on Eastern Avenue in the east end of the City of Toronto after five years of negotiation and dispute (Gray, 2009). At the same time, the decision represented a warning to municipalities that they need to have clear policies in place for the placement of large-format retailing.

Perhaps the broader issue for traditional downtowns will be maintaining retail heterogeneity (including the emergence and survival of independent retailers), and issues related to site design, neighbourhood vitality, and architectural heritage.

During the current economic downturn, consumer spending is in decline. The simultaneous aging of the baby boom will also affect retailing. Over time, a new structural manifestation of price, convenience, and accessibility may emerge in the retail sector.

The future of power retail could include the development of some large-format stores in traditional downtowns and the influx of large-format “brands” into smaller commercial spaces along traditional commercial strips.

These issues contrast somewhat with those of automobile use and land conversion that this report has described in relation to the GTA's suburban retail economy (although identifying the best possible use and site design for brownfield and grey-field sites is also an issue in the inner city).

Lastly, the changing demographics of the consumer market will affect retailing. Seniors typically have less income and mobility, and are therefore less inclined to purchase big-ticket items (Hernandez and Simmons, 2006). Less is known about what the most affluent and mobile "boomer" generation will do as it ages. One school of thought is that consumers will tire of the lack of services, longer-distance automobile trips, and poor-quality pedestrian environments typical of power centres and nodes; the advantage could shift toward more traditional retail formats (Hernandez and Simmons, 2006). Evidence of this sort of response from developers can already be found in the United States (Lorch, 2004).

The retail economy is clearly a moving target, characterized by cycles of growth and rapid change in formats. The Growth Plan as it stands does not adequately address the role of retailing in shaping the region's traffic flows and land use patterns, although the more recent work on planning for employment indicates increasing interest in tackling retail planning (MPIR, 2008). There is clearly a need to develop a flexible policy framework capable of responding to the changes in retail capacity and format that are currently leading to consumer behaviour that is incompatible with the longer-term sustainability and quality of life goals of the plan.

Consumers, particularly aging consumers, may eventually tire of the lack of services, longer-distance automobile trips, and poor-quality pedestrian environments typical of power centres and nodes; the advantage could shift toward more traditional retail formats.

Conclusion

Our findings reveal consumer travel behaviours that are clearly at odds with smart growth principles. The suburbanization of retail, employment, and housing (i.e., the growth of the suburban market), coupled with the rise of clusters of retail activity (power centres), at major highway and arterial intersections, have contributed to the reported steady increase in car-based shopping trips. The Growth Plan promotes mixed-use development as a more sustainable form of growth, but to date there are few examples of mixed-use developments with integrated retail, and therefore limited mixed-use success stories upon which to base retail investment.

While the Growth Plan was developed with a view to changing the region for the better, the processes investigated in this report have remained at the periphery of the discussion. Expansion of retail capacity is mentioned, but little has been provided to date in the way of tools or guidelines for planners who deal with retail development applications. Retail is seen as a land use that should be available within certain mixed-use built environments, yet specific recommendations to reshape the retail-travel relationship are still needed. The Growth Plan contains no measurable retail targets (e.g., thresholds, planning ratios) that regional and municipal planners can use to direct retail to Urban Growth Centres. Meanwhile, debates over residential intensification targets and employment forecasts have tended to overshadow consideration of the consumer commercial landscape.

Further research and objective data is needed to develop retail-based policy that supports growth management objectives. It is to be hoped that this research into the interrelationship of retail development and travel flows will spur a debate on places to shop and how consumers get to those places—a debate that will lead to the creation of planning tools and strategies to achieve the goal of developing compact, complete communities.

To date there are few examples of mixed-use developments with integrated retail, and therefore limited mixed-use success stories upon which to base retail investment.

Further research and objective data is needed to develop retail-based policy that supports growth management objectives.

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Appendix: Kernel Smoothing and the Centographic Description of Retail Growth

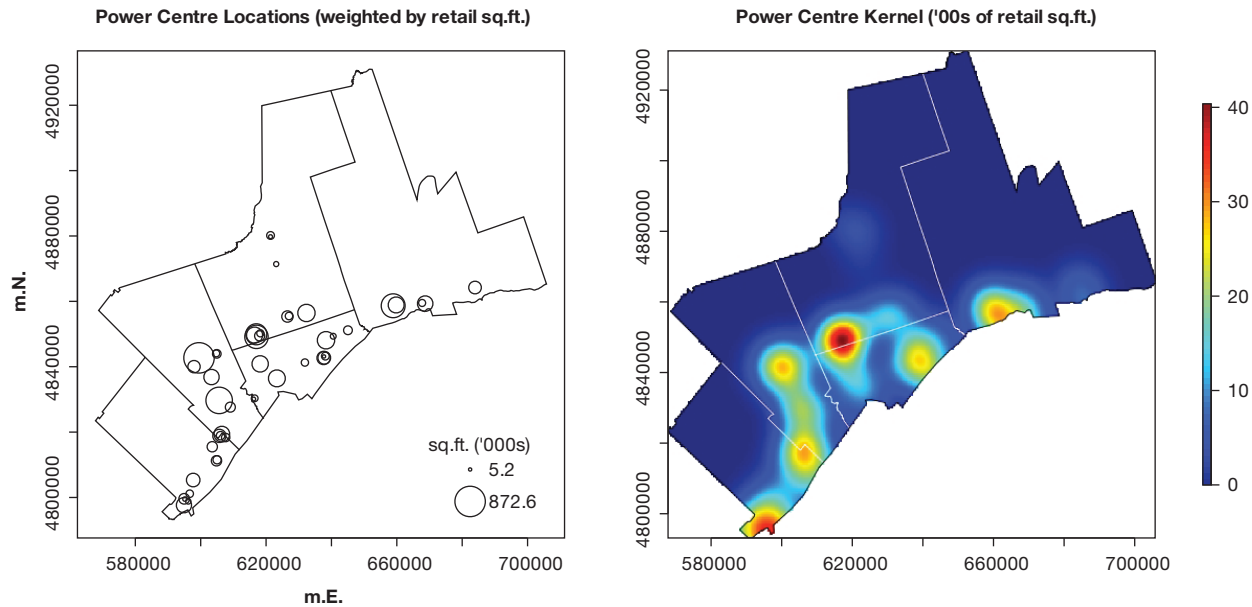
Bivariate kernel estimation produces a smooth estimate of the intensity (i.e., mean number of events per unit area) of a spatial point process across a study region (Bailey and Gatrell, 1995). A spatial point process is one in which underlying forces or systems (e.g., social, economic, etc.) produce point events in geographical space. The approach adopted in this report has been used elsewhere to characterize spatial patterns of point events including crime (Levine, 2006), the location of firms (Maoh and Kanaroglou, 2007), environmental processes, and the incidence of disease (Bailey and Gatrell, 1995). Kernel estimation is used in this study to explore regional variation in the spatial intensity of retail development by format type across the GTA and through time. The approach is exploratory and empirical, and does not produce predictions or forecasts of retail square footage across space.

In certain contexts it is sufficient to use unweighted cases; however, when studying a process such as retail trade, where floorspace correlates with attraction potential, weighting retail location data by some measure of attractiveness can be instructive. In this study, each retail location was assigned a weight equivalent to the location's retail square footage. The weighted bivariate kernel density applied in this research takes the form:

$$\hat{f}(x, y) = \sum_{i=1}^n K \left\{ [w_i * I_i] * \frac{1}{2\pi\sigma^2} e^{[(x-\mu_x)^2 + (y-\mu_y)^2] / 2\sigma^2} \right\}, \quad (1)$$

where $K\{\}$ is a bivariate probability density function referred to as the kernel (e.g., Gaussian, quartic, triangular), which in this example corresponds to the Gaussian, w_i is a weight attached to each retail location i (retail square footage), I_i is the intensity of the spatial point process at each observed retail location (i.e., the mean number of retail locations per unit area), x, y are planar x and y coordinates, and σ is a scale parameter or bandwidth (in measurement units). Kernel surfaces are estimated separately for each of the three retail formats, and for each year of the study period (1996–2005). Adding the temporal dimension facilitates exploration of the extent to which patterns of development have changed both spatially and temporally.

There are several decisions left to the analyst when applying kernel estimation. First, the kernel function $K\{\}$ can take one of several possible forms (e.g., Gaussian, quartic, triangular), and second, a decision needs to be taken regarding the value for the scale parameter, σ (Bailey and Gatrell, 1995; Levine, 2006). The choice regarding $K\{\}$ can be guided by the application context. For example, regional-scale analyses are potentially better suited to the application of the Gaussian function, because the function returns estimates of spatial intensity for locations across the study area (Levine, 2006). With respect to the scale parameter, the degree of

Figure A.1: Weighted Gaussian bivariate kernel estimation (units are retail sq. ft.)

smoothing is influenced by the specification of σ , with larger values providing a smoother estimate of intensity (i.e., points per unit area, or the value of some weight attached to each point – i.e., retail square footage, per unit area).

Because the Gaussian has been chosen for the kernel function, σ is equivalent to the standard deviation of a bivariate normal probability distribution. The bivariate case implies there is a requirement for the specification of σ in both the x and y axes. Here it is assumed that σ is directionally invariant or isotropic ($\sigma = \sigma_x = \sigma_y$). While empirical approaches to identify an appropriate bandwidth have been introduced to the literature (Rowlingson and Diggle, 1993; Bailey and Gatrell, 1995; Levine, 2006), selection can also arise from a quasi-empirical approach where the analyst qualitatively evaluates successive interpolations. A decision regarding the scale parameter will be influenced by the degree to which a particular value of σ provides an instructive view of the spatial process under examination. This latter approach was adopted for this study.

A demonstrative example of the input and result of the kernel estimation process is shown in **Figure A.1**. ($\sigma = 4,500$ m). A bivariate kernel estimate has been created for the spatial pattern of power centre retail locations identified for the year 2000. The estimation was carried out using the weighted Gaussian bivariate kernel function (`density.ppp`) implemented in the *spatstat* library developed by Baddley and Turner (2005) for the R language. Each event has been weighted by its retail square footage, with the resulting surface providing an informative cross-section view of the multiple foci of power retailing in the GTA. Units for the density result have been transformed from retail square feet per unit area (i.e., pixel area), to retail square feet only — a matter of convenience that permits a more intuitive

assessment of the figure's contents (summing across all pixels yields an estimate of total retail square footage within the retail system for the estimation year). The kernel estimation approach offers visual clarification of the geographical proximity of retail locations, and the heterogeneous distribution of retail capacity over space. The resulting surface highlights regional trends in power centre retailing, clearly indicating greater intensity of retail development in the outer suburbs of the study area.