

**EXPLORING PERSON TRAVEL TRENDS IN THE
GREATER TORONTO AREA**

*PART 1: CHANGES IN TRAVEL-RELATED FACTORS AND
IMPLICATIONS FOR TRAVEL DEMAND*

August 30, 1998

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by

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Table of Contents

ACKNOWLEDGEMENT	V
INTRODUCTION.....	1
STUDY OBJECTIVE AND SCOPE	1
STUDY DESIGN.....	1
DOCUMENTATION.....	2
PART 1: CHANGES IN TRAVEL-RELATED FACTORS AND IMPLICATIONS FOR TRAVEL DEMAND	3
1. DEMOGRAPHIC CHARACTERISTICS.....	3
1.1 HOUSEHOLD CHARACTERISTICS	3
1.1.1 Number of Households.....	3
1.1.2 Housing Type.....	5
1.1.3 Household Size.....	5
1.2 PERSONAL CHARACTERISTICS	6
1.2.1 Population	6
1.2.2 Age	7
1.2.3 Gender.....	10
1.3 SUMMARY OF TRENDS AND PERSON TRAVEL DEMAND IMPLICATIONS	11
1.3.1 Trends.....	11
1.3.2 Implications	12
2. SOCIO-ECONOMIC CHARACTERISTICS	13
2.1 HOUSEHOLD CHARACTERISTICS	13
2.1.1 Number and Employment Status of Household Workers	13
2.1.2 Composition of Household	15
2.2 EMPLOYED LABOUR FORCE CHARACTERISTICS	19
2.2.1 Employed Labour Force Participation Rate	19
2.2.2 Residential Location Distribution.....	22
2.2.3 Employment Location Distribution.....	23
2.2.4 Age	24
2.2.5 Gender.....	25
2.2.6 Occupation Type characteristics in 1996	26
2.3 SUMMARY OF TRENDS AND PERSON TRAVEL DEMAND IMPLICATIONS	29
2.3.1 Trends.....	29
2.3.2 Implications	29
3. URBAN ACTIVITY SYSTEM CHARACTERISTICS	32
3.1 LAND USE DENSITY.....	32
3.1.1 Population Density.....	32
3.1.2 Employment Density	34
3.2 SPATIAL INTERACTION	36
3.2.1 Employment - Employed Labour Force Balance.....	41
3.2.2 Self Containment.....	42
3.2.3 Spatial Markets.....	42
3.3 HOME-WORK DISTANCE.....	47
3.4 SUMMARY OF TRENDS AND PERSON TRAVEL DEMAND IMPLICATIONS	49
3.4.1 Trends.....	49
3.4.2 Implications	49
4. MOBILITY CHARACTERISTICS	51
4.1 CHARACTERISTICS OF LICENCED DRIVERS	51
4.1.1 Driver's Licence Possession Rate.....	51

Table of Contents

4.1.2 Number and Distributions of Licenced Drivers.....	52
4.2 HOUSEHOLD VEHICLES	53
4.2.1 Household Vehicle Ownership.....	53
4.2.2 Number and Regional Distribution of Household Vehicles	55
4.2.3 Vehicle Availability.....	55
4.3 MOBILITY BY PERSONAL VEHICLES FOR WORKERS	57
4.3.1 Free Parking Availability at Usual Place of Work.....	57
4.3.2 Distribution of GTA Workers by Vehicle and Parking Availability.....	58
4.4 SUMMARY OF TRENDS AND PERSON TRAVEL DEMAND IMPLICATIONS	59
4.4.1 Trends.....	59
4.4.2 Implications	60
5. TRANSPORTATION SYSTEM CHARACTERISTICS	61
6. SUMMARY OF TRENDS AND IMPLICATIONS.....	62
REFERENCES.....	64

List of Exhibits

EXHIBIT 1.1: REGIONAL DISTRIBUTION OF HOUSEHOLDS	3
EXHIBIT 1.2: DISTRIBUTION OF AND CHANGE IN HOUSEHOLDS	4
EXHIBIT 1.3: DISTRIBUTION OF HOUSEHOLD TYPE.....	5
EXHIBIT 1.4: DISTRIBUTION OF HOUSEHOLD SIZE	5
EXHIBIT 1.5: AVERAGE HOUSEHOLD SIZE	6
EXHIBIT 1.6: REGIONAL DISTRIBUTION OF POPULATION.....	6
EXHIBIT 1.7: DISTRIBUTION OF AND CHANGE IN POPULATION	7
EXHIBIT 1.8: AGE PROFILE OF THE GTA POPULATION	7
EXHIBIT 1.9: GTA POPULATION CHANGE BY AGE COHORT	8
EXHIBIT 1.10: PERCENTAGE CHANGE IN GTA POPULATION BY AGE COHORT	8
EXHIBIT 1.11: DISTRIBUTION OF AGE COHORTS	9
EXHIBIT 1.12: MEDIAN AGE OF REGIONAL POPULATIONS.....	9
EXHIBIT 1.13: SHIFTED AGE PROFILE OF THE GTA POPULATION.....	10
EXHIBIT 1.14: GENDER COMPOSITION OF THE GTA POPULATION	10
EXHIBIT 1.15: AGE PROFILES OF GTA MALE AND FEMALE POPULATIONS.....	11
EXHIBIT 1.16: MEDIAN AGE OF GTA MALE AND FEMALE POPULATIONS	11
EXHIBIT 1.17: SUMMARY OF DEMOGRAPHIC CHARACTERISTICS (1986-1996)	12
EXHIBIT 2.1: CHANGE IN HOUSEHOLDS BY EMPLOYMENT STATUS ¹ AND NUMBER OF HOUSEHOLD WORKERS - 1986-1991	13
EXHIBIT 2.2: CHANGE IN HOUSEHOLDS BY EMPLOYMENT STATUS AND NUMBER OF HOUSEHOLD WORKERS - 1991-1996	13
EXHIBIT 2.3: DISTRIBUTION OF HOUSEHOLDS BY STATUS AND NUMBER OF HOUSEHOLD WORKERS	15
EXHIBIT 2.4: AVERAGE NUMBER OF HOUSEHOLD WORKERS	15
EXHIBIT 2.5: DISTRIBUTION OF HOUSEHOLD COMPOSITION.....	16
EXHIBIT 2.6: CHANGE IN HOUSEHOLD COMPOSITION	17
EXHIBIT 2.7: SUMMARY DISTRIBUTION OF HOUSEHOLD COMPOSITION	18
EXHIBIT 2.8: EMPLOYED LABOUR FORCE PARTICIPATION RATE (ELFPR).....	19
EXHIBIT 2.9: FULL-TIME LABOUR FORCE PARTICIPATION RATE (FTLFPR) BY AGE.....	19
EXHIBIT 2.10: PART-TIME LABOUR FORCE PARTICIPATION RATE (PTLFPR) BY AGE.....	20
EXHIBIT 2.11: WORK-AT-HOME LABOUR FORCE PARTICIPATION RATE (WAHLFPR) BY AGE.....	20
EXHIBIT 2.12: EMPLOYED LABOUR FORCE PARTICIPATION RATE BY GENDER.....	21
EXHIBIT 2.13: EMPLOYED LABOUR FORCE PARTICIPATION RATE BY REGION OF RESIDENCE.....	21
EXHIBIT 2.14: EMPLOYED LABOUR FORCE BY STATUS AND REGION OF RESIDENCE	22
EXHIBIT 2.15: DISTRIBUTION OF EMPLOYED LABOUR FORCE BY REGION OF RESIDENCE.....	22
EXHIBIT 2.16: EMPLOYED LABOUR FORCE BY REGION OF EMPLOYMENT ⁽¹⁾	23
EXHIBIT 2.17: DISTRIBUTION OF EMPLOYED LABOUR FORCE BY REGION OF EMPLOYMENT	24
EXHIBIT 2.18: DISTRIBUTION OF EMPLOYED LABOUR FORCE BY AGE.....	24
EXHIBIT 2.19: MEDIAN AGE OF LABOUR FORCE BY EMPLOYMENT STATUS	25
EXHIBIT 2.20: CHANGE IN LABOUR FORCE BY GENDER AND EMPLOYMENT STATUS	25
EXHIBIT 2.21: DISTRIBUTION OF EMPLOYED LABOUR FORCE BY GENDER AND EMPLOYMENT STATUS	26
EXHIBIT 2.22: 1996 DISTRIBUTION OF OCCUPATION TYPE	26
EXHIBIT 2.23: 1996 DISTRIBUTION OF OCCUPATION TYPE BY EMPLOYMENT STATUS.....	27
EXHIBIT 2.24: 1996 MEDIAN AGE OF GTA WORKERS BY OCCUPATION TYPE.....	27
EXHIBIT 2.25: 1996 DISTRIBUTION OF WORKERS' OCCUPATION TYPE BY AGE	27
EXHIBIT 2.26: 1996 DISTRIBUTION OF GENDER BY OCCUPATION TYPE.....	28
EXHIBIT 2.27: 1996 DISTRIBUTION OF WORKERS' OCCUPATION TYPE BY GENDER	28
EXHIBIT 2.28: 1996 DISTRIBUTION OF RESIDENTIAL LOCATION BY OCCUPATION TYPE	29
EXHIBIT 2.29: 1996 DISTRIBUTION OF EMPLOYMENT LOCATION BY OCCUPATION TYPE.....	29
EXHIBIT 2.30: SUMMARY OF SOCIO-ECONOMIC CHARACTERISTICS (1986-1996).....	30
EXHIBIT 3.1: 1986 POPULATION DENSITY	32
EXHIBIT 3.2: 1991 POPULATION DENSITY	33
EXHIBIT 3.3: 1996 POPULATION DENSITY	33
EXHIBIT 3.4: DISTRIBUTION OF ZONAL POPULATION DENSITY (RESIDENTS/SQ. KM.)	34
EXHIBIT 3.5: AVERAGE ZONAL POPULATION DENSITY (RESIDENTS/SQ. KM.)	34

List of Exhibits

EXHIBIT 3.6: 1991 EMPLOYMENT DENSITY	35
EXHIBIT 3.7: 1996 EMPLOYMENT DENSITY	35
EXHIBIT 3.8: AVERAGE ZONAL EMPLOYMENT DENSITY (JOBS/SQ. KM.).....	36
EXHIBIT 3.9: THE GTA REGIONS.....	37
EXHIBIT 3.10: 1986 PLACE OF RESIDENCE-PLACE OF WORK LINKAGES.....	38
EXHIBIT 3.11: 1991 PLACE OF RESIDENCE-PLACE OF WORK LINKAGES.....	39
EXHIBIT 3.12: 1996 PLACE OF RESIDENCE-PLACE OF WORK LINKAGES.....	40
EXHIBIT 3.13: REGIONAL EMPLOYMENT-EMPLOYED LABOUR FORCE (ELF) BALANCE.....	41
EXHIBIT 3.14: REGIONAL SELF-CONTAINMENT OF EMPLOYED LABOUR FORCE	42
EXHIBIT 3.15: EMPLOYED LABOUR FORCE IN SPATIAL MARKETS	43
EXHIBIT 3.16: DISTRIBUTION OF ELF SPATIAL MARKETS	43
EXHIBIT 3.17: PD 1 WORKERS BY REGION OF RESIDENCE.....	44
EXHIBIT 3.18: DISTRIBUTION OF RESIDENTIAL LOCATION FOR WORKERS IN PD 1.....	44
EXHIBIT 3.19: SPATIAL INTERACTION FOR WORKERS RESIDING AND WORKING IN TORONTO	45
EXHIBIT 3.20: SPATIAL INTERACTION FOR WORKERS RESIDING AND WORKING IN THE 905 BELT.....	45
EXHIBIT 3.21: SPATIAL INTERACTION FOR WORKERS RESIDING IN THE 905 BELT AND WORKING IN TORONTO	46
EXHIBIT 3.22: SPATIAL INTERACTION FOR WORKERS RESIDING IN TORONTO AND WORKING IN THE 905 BELT	46
EXHIBIT 3.23: MEDIAN STRAIGHT-LINE DISTANCE BETWEEN HOME AND WORK BY AGE	47
EXHIBIT 3.24: MEDIAN STRAIGHT-LINE DISTANCE BETWEEN HOME AND WORK BY SHIFTED AGE COHORTS	47
EXHIBIT 3.25: MEDIAN STRAIGHT-LINE DISTANCE BETWEEN HOME AND WORK BY GENDER	48
EXHIBIT 3.26: MEDIAN STRAIGHT-LINE DISTANCE BETWEEN HOME AND WORK BY REGION OF RESIDENCE	48
EXHIBIT 3.27: SUMMARY OF URBAN ACTIVITY SYSTEM CHARACTERISTICS (1986-1996).....	50
EXHIBIT 4.1: POSSESSION RATE OF A DRIVER'S LICENCE BY AGE FOR FEMALES	51
EXHIBIT 4.2: POSSESSION RATE OF A DRIVER'S LICENCE BY AGE FOR MALES	51
EXHIBIT 4.3: POSSESSION RATE OF A DRIVER'S LICENCE BY REGION OF RESIDENCE	52
EXHIBIT 4.4: DISTRIBUTION OF LICENCED FEMALE DRIVERS BY AGE.....	52
EXHIBIT 4.5: DISTRIBUTION OF LICENCED MALE DRIVERS BY AGE.....	53
EXHIBIT 4.6: DISTRIBUTION OF LICENCED DRIVERS BY REGION OF RESIDENCE	53
EXHIBIT 4.7: CHANGE IN HOUSEHOLDS BY NUMBER OF HOUSEHOLD VEHICLES - 1986-1991	54
EXHIBIT 4.8: CHANGE IN HOUSEHOLDS BY NUMBER OF HOUSEHOLD VEHICLES - 1991-1996	54
EXHIBIT 4.9: AVERAGE NUMBER OF VEHICLES PER HOUSEHOLD BY REGION OF RESIDENCE.....	55
EXHIBIT 4.10: DISTRIBUTION OF GTA HOUSEHOLD VEHICLES BY REGION OF HOUSEHOLD.....	55
EXHIBIT 4.11: CHANGE IN NUMBER OF VEHICLE-OWNING HOUSEHOLDS BY VEHICLE AVAILABILITY - 1986-91	56
EXHIBIT 4.12: CHANGE IN NUMBER OF VEHICLE-OWNING HOUSEHOLDS BY VEHICLE AVAILABILITY - 1991-96	56
EXHIBIT 4.13: VEHICLE AVAILABILITY BY REGION OF RESIDENCE.....	57
EXHIBIT 4.14: PROPORTION OF EMPLOYEES WITH FREE PARKING AT USUAL PLACE OF WORK.....	58
EXHIBIT 4.15: DISTRIBUTION OF GTA WORKERS BY VEHICLE AND PARKING AVAILABILITY	58
EXHIBIT 4.16: SUMMARY OF MOBILITY CHARACTERISTICS (1986-1996).....	59

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Although this study has its own objectives and approach, it benefitted from the approaches and observations of other studies on person travel trends in the Greater Toronto Area. These studies are:

- University of Toronto Joint Program in Transportation, *A Summary of Changes in the Travel Characteristics of the Greater Toronto Area, 1986 to 1991*, December 1992.
- University of Toronto Joint Program in Transportation, *Travel Trends in the City of Mississauga - 1986 to 1991*, June 1993.
- IBI Group, *An Assessment of Transportation Trends in the GTA: Transportation Trends Analysis*, prepared for the Ministry of Transportation, Ontario, October 1997.

INTRODUCTION

Identifying trends of person travel is of prime importance in transportation planning. Among other things, person travel trends show the direction and magnitude of changes in person travel patterns in the past, which are key to assessing the use of the transportation infrastructure and its economic and environmental implications. However, understanding the factors underlying person travel trends is equally important, since such understanding helps explain why person travel trends occurred, what future changes in person travel are likely to happen if past trends of factors continue in the future and which actions should be considered for effective management of future person travel trends. Also, the analysis of person travel trends and the key factors shaping these trends improves our understanding of personal travel behaviour and improves the capability of forecasting future travel demand. In addition, trend analyses help identify needs and opportunities emerging in the urban area.

STUDY OBJECTIVE AND SCOPE

This study seeks to explore person travel trends in the Greater Toronto Area (GTA) and develop an improved understanding of the factors shaping these trends.

The study focuses on person travel trends in the past and their relationships with changes in travel-related factors. It does not concern itself with making future projections of person travel or identifying policy directions that should be taken in response to the observed trends. However, such initiatives can benefit from the results of this study.

The study is motivated partly by the availability of three large cross-sectional travel surveys, known as the Transportation Tomorrow Surveys (TTS), which were conducted systematically in 1986, 1991 and 1996 on residents in the GTA. The surveys provide consistent demographic, socio-economic and travel data on the urban residents. Each survey represents a one-day snap shot of travel and personal characteristics at the respective year. The datasets produced from these three surveys are the primary sources used in this study. Other sources of data are cited appropriately when they are used.

STUDY DESIGN

Person travel demand depends to some extent on the demographic and socio-economic attributes of the population. Also, since demand for person travel is a derived demand (i.e. people travel to engage in a desired activity at a specific destination), it has an inter-relationship with the urban activity system (i.e. spatial interaction between urban activity markets). In addition, demand for person travel has an inter-relationship with the mobility characteristics of the urban residents and the transportation system characteristics. As such, it is important to examine changes in these factors as a pre-requisite for the examination of changes in person travel. Therefore, this study is divided into two parts: (1) Changes in demographic, socio-economic, urban activity system, mobility and transportation system characteristics and (2) Changes in person travel. While Part 1 provides implications of the observed changes for person travel demand, Part 2 provides a more detailed examination of changes in person travel and their relationships with changes in relevant travel-related factors examined in Part 1.

In both parts, the available variables are analysed individually as well as jointly (e.g. cross-tabulated) with other relevant variables, one at a time, for the years 1986, 1991 and 1996. In general, household characteristics are examined first, followed by personal characteristics. Where appropriate, age cohorts of five-year intervals are shifted by five years for the 1991 data and by ten years for the 1986 data to examine changes in characteristics of the same age cohort population over time.

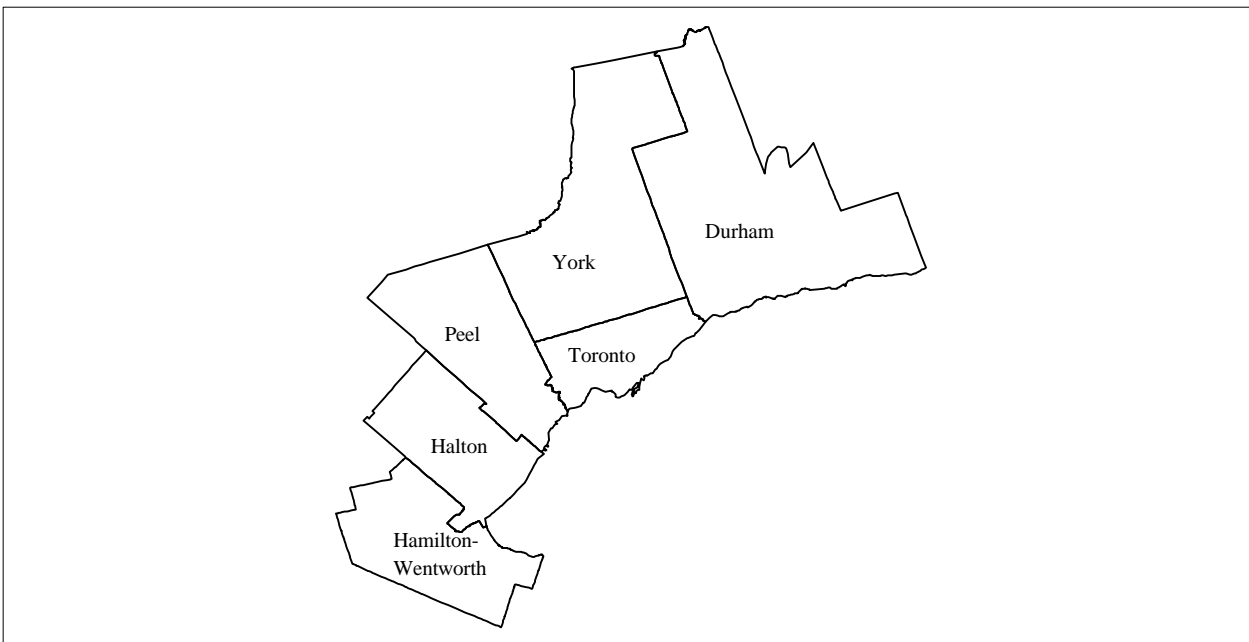
Exploring Person Travel Trends in the Greater Toronto Area

Some cautionary notes are due here. First, the analysis is based on data from travel surveys and, as such, they provide only estimates of the phenomena under examination. These estimates may differ from estimates based on other data sources (e.g. socio-economic and demographic estimates from the TTS vs. the Census). However, validation studies conducted by the Joint Program in Transportation have shown that the TTS provides, in general, reliable estimates.

Second, some degree of under-reporting has been detected in the travel data, particularly in discretionary trips and during off-peak periods, since one person only from each household in the survey was requested to report on the trips made by all household members. No attempt is made in this study to correct for such under-reporting. Although the effect of under-reporting on the results is expected to be minor due to the generally consistent survey design in the three years, discrepancies in the results might be partly due to different under-reporting rates in the three surveys.

In this analysis, a joint examination of two variables helps identify changes in different combinations of the two variables, and it also helps develop an improved understanding of the relationship between the two variables. However, caution should be exercised in interpreting the results. For example, a cross tabulation of two variables does not control for other variables, and observed patterns might be due to those other variables. Also, a cross tabulation does not suggest cause and effect. However, it is hoped that the understanding of the cause-and-effect relationships is improved through the use of the three datasets in this study.

As mentioned earlier, the study area is the Greater Toronto Area, shown in the exhibit below. The GTA consists of the City of Toronto and five other regions which are commonly known as the “905 Belt”. As defined for political purposes the GTA does not include Hamilton-Wentworth, but it has been included in the study area in this study.



DOCUMENTATION

The results of this study are documented in two reports. The remainder of this report constitutes Part 1 of the study, and Part 2 is documented in a companion report.

PART 1: CHANGES IN TRAVEL-RELATED FACTORS AND IMPLICATIONS FOR TRAVEL DEMAND

As noted earlier, the factors dealt with in this part include demographic, socio-economic, urban activity system, mobility and transportation system characteristics. At any point in time, the magnitude of urban person travel is determined largely by the population size of the urban area, but it is the set of distributions of the above characteristics which determines the patterns of urban person travel. Even though Part 1 of the study examines growth of the population, it focuses primarily on changes in the distributions of the travel-related characteristics examined here.

1. DEMOGRAPHIC CHARACTERISTICS

This chapter is concerned with changes in demographic characteristics in the GTA. Specifically, it deals with changes in the numbers and distributions of GTA households and residents, housing type, household size, age and gender.

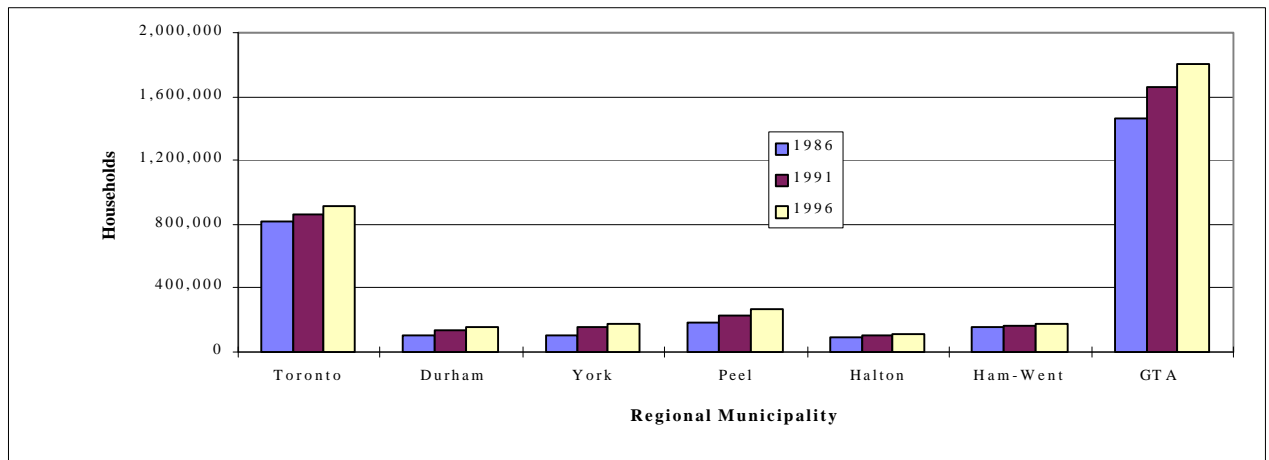
1.1 HOUSEHOLD CHARACTERISTICS

The household is the dwelling unit in which a group of people reside. In the context of urban person travel demand, it is important to examine changes in household population and composition for a host of reasons. For example, demand for certain trip purposes (e.g. shopping trips) is best measured at a household level since such trips are likely generated to satisfy the needs of all household members. Also, interactions between household members affect the number, mode and route of personal trips (e.g. drop children at day-care on way to work).

1.1.1 Number of Households

Exhibit 1.1 presents the regional distribution of households in 1986, 1991 and 1996. Exhibit 1.2 provides more detail on the regional distribution of and changes in households. The exhibits show that the number of GTA households grew by 13% (190,000 households) between 1986 and 1991 and by 9% (149,000 households) between 1991 and 1996 to reach a level of slightly more than 1.8 million households.

Exhibit 1.1: Regional Distribution of Households



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 1.2: Distribution of and Change in Households

Households			Change			
	1986	1991	1996		1986-1991	1991-1996
Toronto	820,776	864,534	908,505	Toronto	43,758	43,971
				% Change	5.3%	5.1%
GTA %	56.0%	52.2%	50.3%	% of Growth	23.0%	29.5%
Durham	106,046	136,178	154,288	Durham	30,132	18,110
				% Change	28.4%	13.3%
GTA %	7.2%	8.2%	8.5%	% of Growth	15.9%	12.2%
York	106,016	150,450	178,202	York	44,434	27,752
				% Change	41.9%	18.4%
GTA %	7.2%	9.1%	9.9%	% of Growth	23.4%	18.6%
Peel	186,762	229,698	266,543	Peel	42,936	36,844
				% Change	23.0%	16.0%
GTA %	12.7%	13.9%	14.8%	% of Growth	22.6%	24.7%
Halton	90,212	106,424	118,403	Halton	16,212	11,980
				% Change	18.0%	11.3%
GTA %	6.2%	6.4%	6.6%	% of Growth	8.5%	8.0%
Ham-Went	156,265	168,752	179,080	Ham-Went	12,487	10,329
				% Change	8.0%	6.1%
GTA %	10.7%	10.2%	9.9%	% of Growth	6.6%	6.9%
GTA	1,466,077	1,656,035	1,805,021	GTA	189,959	148,986
				% Change	13.0%	9.0%

As evidenced in the exhibits, most of the growth between 1986 and 1996 occurred outside Toronto. Even though the 905 Belt accommodated less than half of the GTA households in 1986, it attracted 77% of the GTA growth in households between 1986 and 1991, and 70.5% of the growth in the following 5 years.

Between 1986 and 1991, York experienced the highest rate of growth (42%), and it attracted the largest share of the GTA growth in households (23.4%). During the same period, each of Peel and Toronto also attracted almost 23% of the GTA growth in households. York, followed by Peel, continued to be the fastest growing regions in the GTA between 1991 and 1996. However, York attracted a smaller share of the GTA growth between 1991 and 1996 compared to the preceding five years, while each of Toronto and Peel attracted larger shares of the GTA growth between 1991 and 1996 compared to the preceding five years. Each of Durham and Halton maintained a smaller share of the GTA growth than York and Peel in the two five-year periods, yet they attracted larger shares than Hamilton-Wentworth. It is noteworthy that each 905-Belt region experienced a relatively much lower growth rate in the second period as compared to the first period. In both periods, both Toronto and Hamilton-Wentworth experienced the lowest growth rates.

As a result of the above, Toronto's share of the GTA households fell from 56% in 1986 to almost 50% in 1996. During the same period, Peel strengthened its position as the second largest GTA region with respect to number of households, accommodating almost 15% of all GTA households in 1996, while York rose to share the third position with Hamilton-Wentworth, each having almost 10% of the 1996 GTA households. Durham and Halton, though experienced a moderate growth, continued to represent the smallest two GTA regions in 1996.

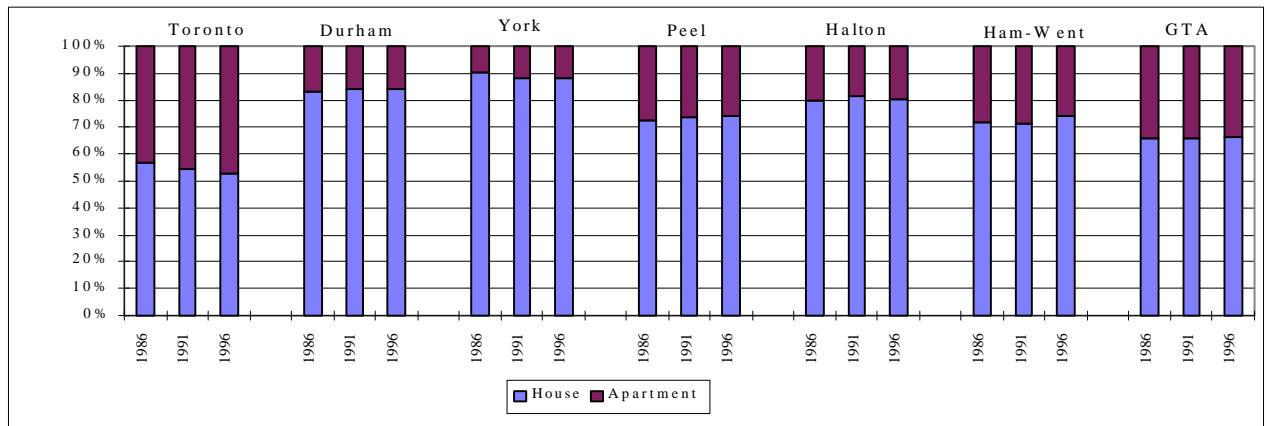
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Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

1.1.2 Housing Type

The GTA composition of housing type remained constant in the two periods (66% of households were houses and 34% were apartments), as shown in Exhibit 1.3. The definition of houses here includes single/semi-detached, link, row houses and townhouses. Toronto represents the region with the largest local share of apartments, while York ranks last. However, both regions experienced higher growth in the number of apartments compared to houses. As a result, the apartment share in each of the two regions increased in 1996 compared to the 1986 levels. In contrast, the other four regions experienced higher growth in the number of houses compared to apartments, as shown in the exhibit.

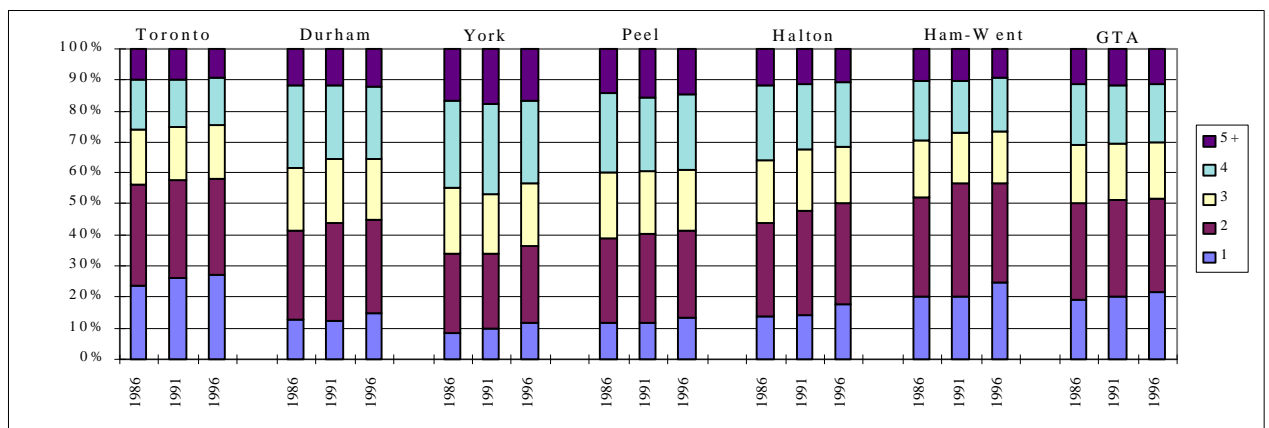
Exhibit 1.3: Distribution of Household Type



1.1.3 Household Size

Even though 50% of the GTA households in 1986 accommodated either one or two persons, these households (i.e. one- and two- person households) constituted almost 61% of the total growth in households in the first five-year period and 60% of the growth in the second period. As a result, the share of small-size households in the GTA increased in both periods, as shown in Exhibit 1.4. Specifically, households accommodating one person only constituted 22% of the GTA households in 1996, up from 20% in 1991 and 19% in 1986

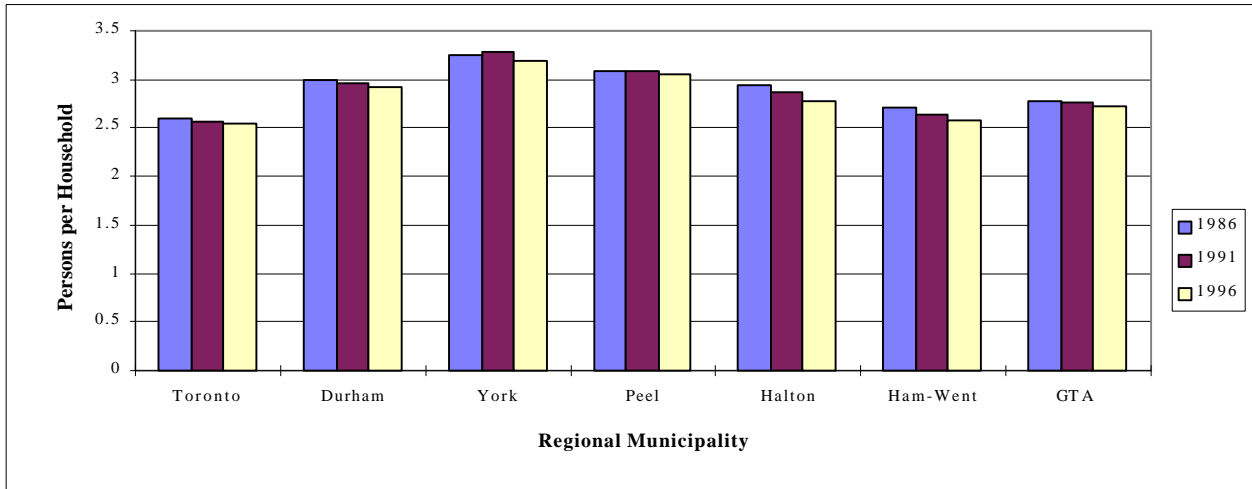
Exhibit 1.4: Distribution of Household Size



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

The increase in share of one-person households occurred in all regions, as shown in the exhibit. By 1996, each of Toronto and Hamilton-Wentworth continued to have the largest local share of one- and two-person households, at slightly less than 60%, while York ranked last at around 37%. The corresponding local shares in Durham, Peel and Halton were in between these two figures in 1996. As expected, the average household size decreased in all regions, as shown in Exhibit 1.5.

Exhibit 1.5: Average Household Size

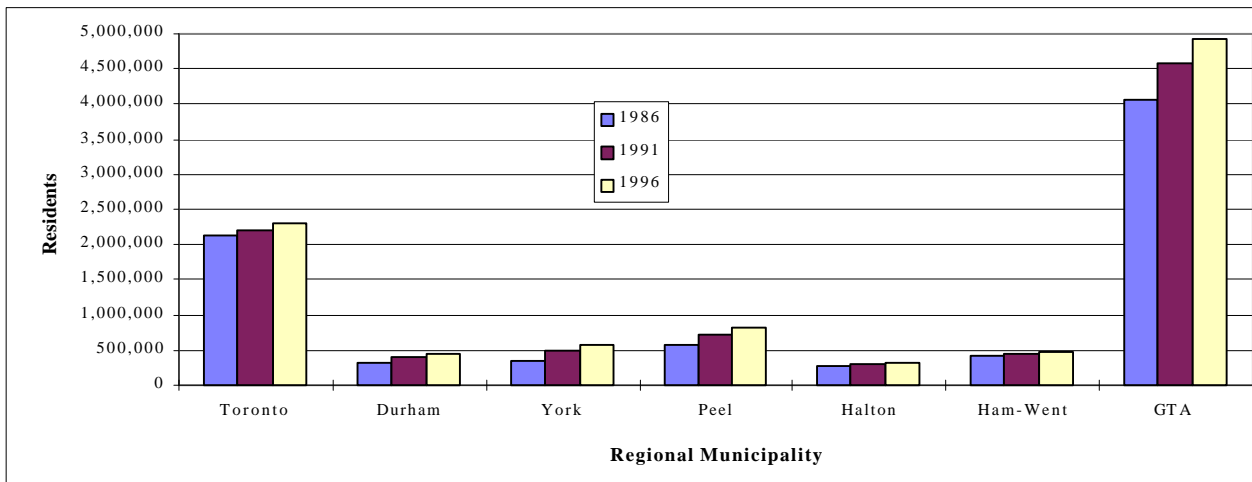


1.2 PERSONAL CHARACTERISTICS

1.2.1 Population

The GTA population increased by 12.5% (slightly more than half a million residents) from 1986 to 1991 and by 7.8% (slightly more than 350 thousand residents) from 1991 to 1996, as shown in Exhibits 1.6 and 1.7. As of 1996, the GTA hosted nearly 5 million residents. It is noteworthy that the growth rates of the population are less than the growth rates of households, which is reflected by the reduced household size observed earlier.

Exhibit 1.6: Regional Distribution of Population



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 1.7: Distribution of and Change in Population

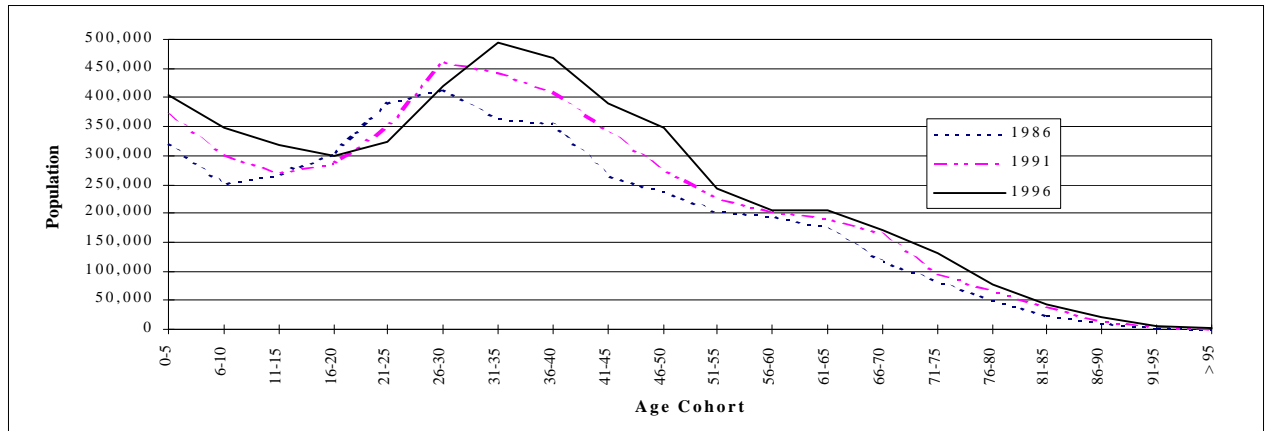
	Number of Residents			Change		
	1986	1991	1996		1986-1991	1991-1996
Toronto	2,135,017	2,214,103	2,305,558	Toronto	79,086	91,455
GTA %	52.5%	48.5%	46.8%	% Change	3.7%	4.1%
Durham	317,886	402,577	450,354	% of Growth	15.6%	25.6%
GTA %	7.8%	8.8%	9.1%	Durham	84,691	47,777
York	344,986	493,399	567,689	% Change	26.6%	11.9%
GTA %	8.5%	10.8%	11.5%	% of Growth	16.7%	13.4%
Peel	577,032	709,840	812,512	York	148,414	74,290
GTA %	14.2%	15.5%	16.5%	% Change	43.0%	15.1%
Halton	264,630	304,920	328,264	% of Growth	29.3%	20.8%
GTA %	6.5%	6.7%	6.7%	Peel	132,808	102,672
Ham-Went	423,398	444,767	461,990	% Change	23.0%	14.5%
GTA %	10.4%	9.7%	9.4%	% of Growth	26.2%	28.8%
				Halton	40,290	23,344
				% Change	15.2%	7.7%
				% of Growth	8.0%	6.5%
				Ham-Went	21,369	17,223
				% Change	5.0%	3.9%
				% of Growth	4.2%	4.8%
GTA	4,062,949	4,569,607	4,926,368	GTA	506,658	356,761
				% Change	12.5%	7.8%

As with households, York experienced the highest population growth rates in both periods. In general, the observations made for the number of households are applicable here. One difference though is that, by 1991, York surpassed Hamilton-Wentworth in terms of population size and, by 1996, Durham's population came very close to that of Hamilton-Wentworth. This difference can be explained partly by the relatively faster growth of small-size households in Toronto and Hamilton-Wentworth than in Durham, York and Peel.

1.2.2 Age

The age profiles of the GTA residents, displayed in Exhibit 1.8, show that almost the entire "Baby Boom" generation, those born between the mid-forties and the mid-sixties, was still at the stage of family formation during the 1986-1996 decade.

Exhibit 1.8: Age Profile of the GTA Population



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

The “Baby Boom Echo” also shows very prominently in the profiles. However, the increase in the number of babies born between 1991 and 1996 was much smaller than the increase in the number of babies born in the previous five years, as shown in Exhibit 1.9. The exhibit also shows that the populations of most age cohorts increased in size in both periods, with the exception of the age cohorts ‘16-20’ and ‘21-25’ in the first period and the cohorts ‘21-25’ and ‘26-30’ in the second period. In terms of percentage change, Exhibit 1.10 shows that populations of the older age cohorts experienced the highest growth rate.

Exhibit 1.9: GTA Population Change by Age Cohort

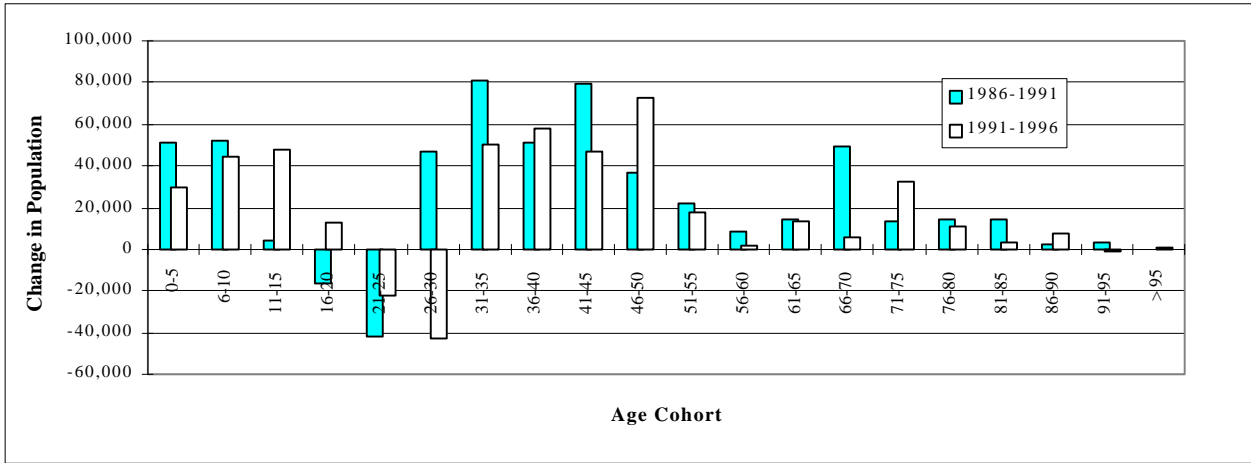
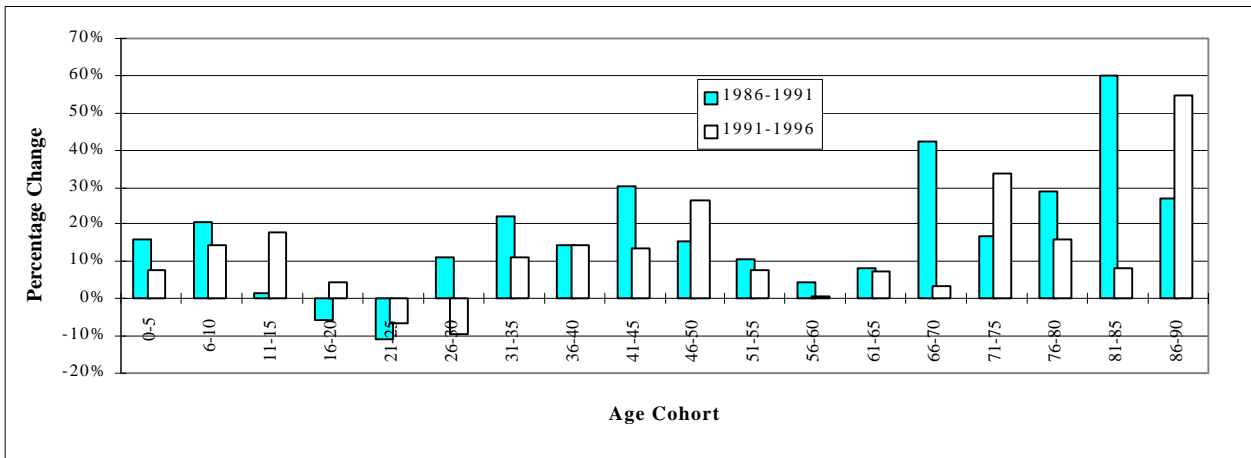


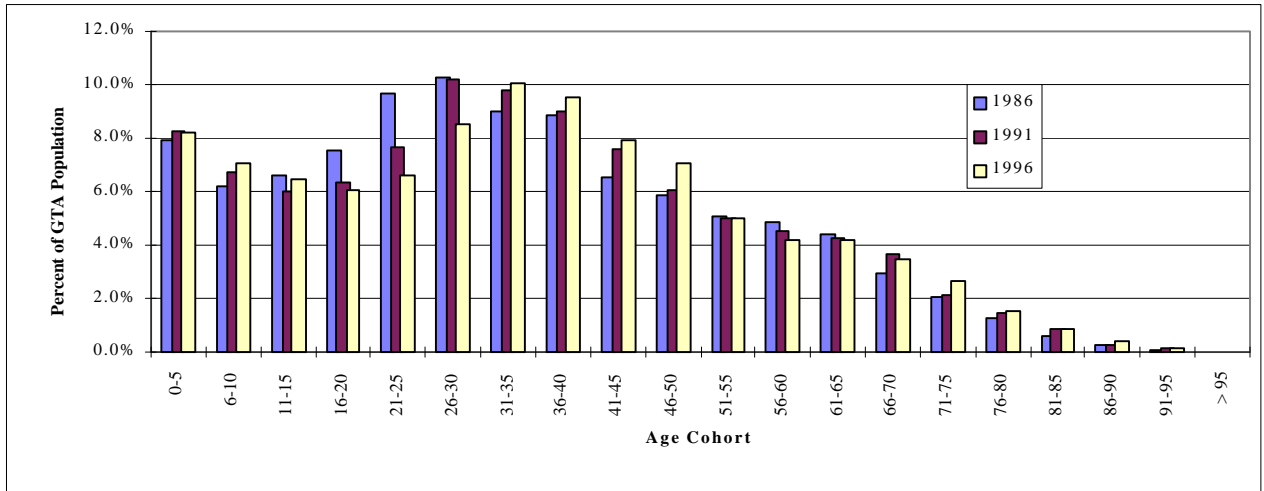
Exhibit 1.10: Percentage Change in GTA Population by Age Cohort



The trends noted above resulted in changes in the age distribution of the GTA population, as shown in Exhibit 1.11. The most notable changes include the reduction in the percentage of persons aged 16-30 from 27.4% in 1986 to 21.2% in 1996 and the corresponding increase in the percentage of persons aged 31-50 from 30.3% in 1986 to 34.6% in 1996. The percentage of persons 66 or above also increased from 7.2% in 1986 to 9.1% in 1996.

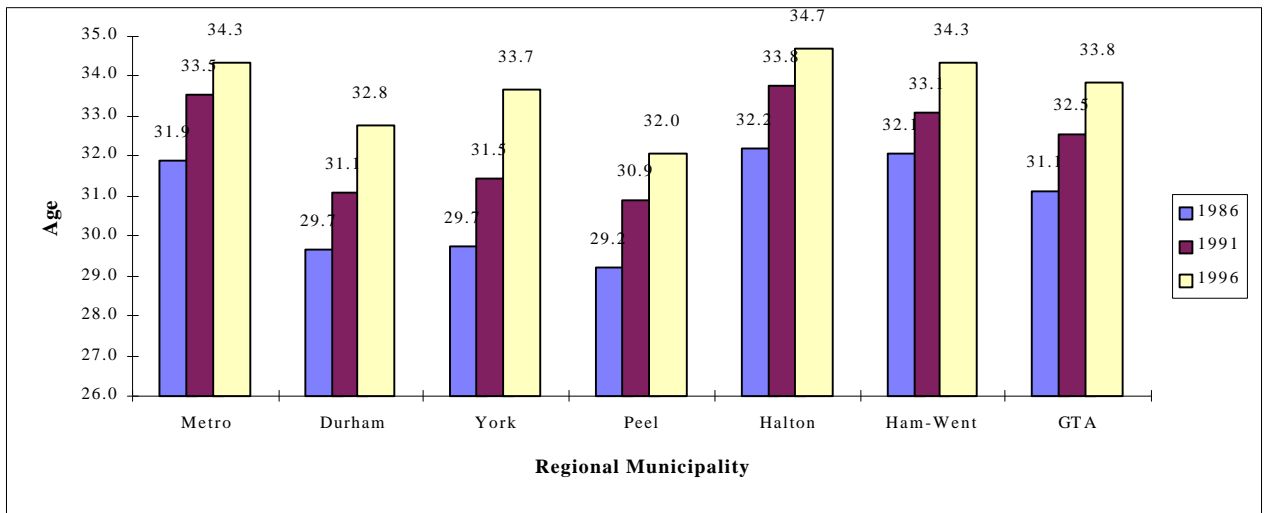
Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 1.11: Distribution of Age Cohorts



In general, the median age of the population increased across the GTA, as shown in Exhibit 1.12. By 1996, the median age of the GTA population reached 33.8; regional median age ranged between 32 in Peel to 34.7 in neighbouring Halton.

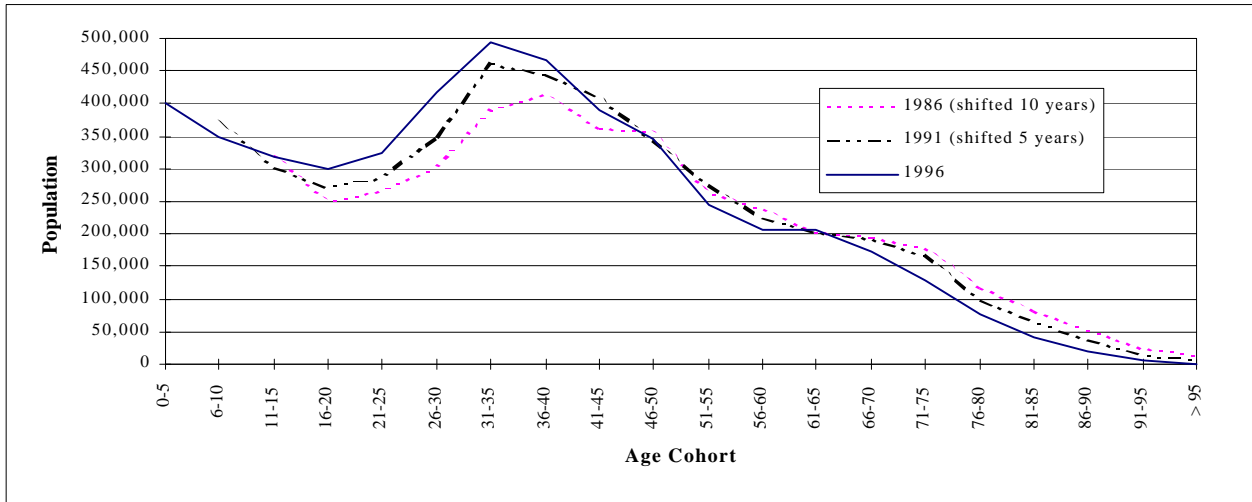
Exhibit 1.12: Median Age of Regional Populations



To develop an understanding of some of the factors contributing to the emerging age composition of the population, Exhibit 1.13 displays the 1996 age profile, along with the 1991 profile shifted by 5 years and the 1986 profile shifted by 10 years. These latter two profiles provide an indication of what the 1996 age profile would have looked like, all else being equal. The exhibit shows the effect of immigration into the urban area. This is particularly pronounced for persons of age between 11 and 50, including the “Baby Boomers”. For persons beyond 50 years of age, out-migration and mortality play a more pronounced role than other factors.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

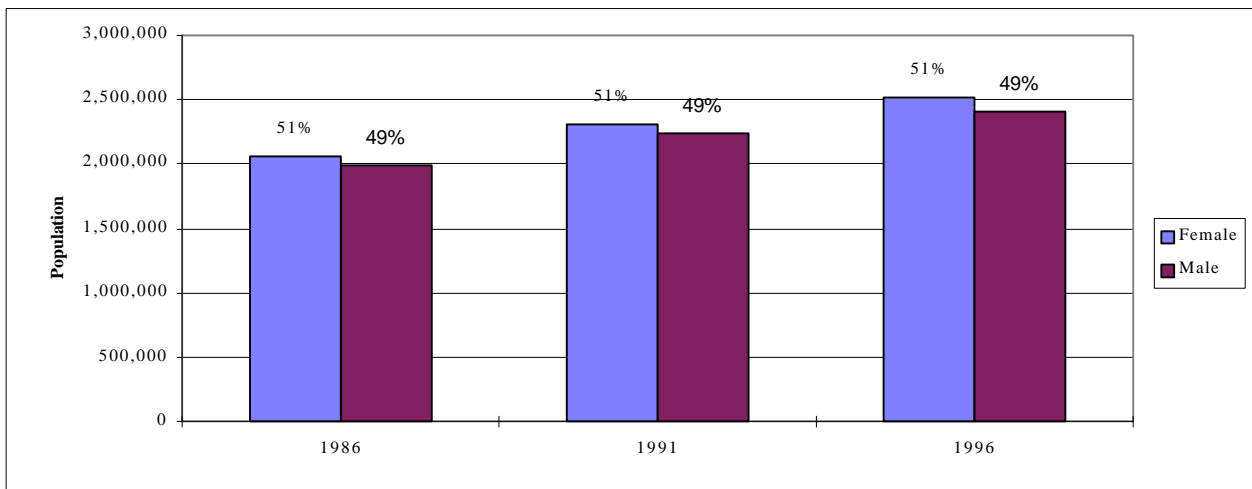
Exhibit 1.13: Shifted Age Profile of the GTA Population



1.2.3 Gender

The gender composition of the GTA population remained constant between 1986 and 1996 with females constituting 51% of the population and males 49%, as shown in Exhibit 1.14. However, Exhibit 1.15 indicates that the number of males 25 years of age or younger was consistently larger than the corresponding number of females in the three survey years, while the number of older males was consistently smaller than the corresponding number of females. If this trend continues, it is expected that the population proportion of males may exceed the proportion of females. Exhibit 1.16 shows the higher median age of females than that of males

Exhibit 1.14: Gender Composition of The GTA Population

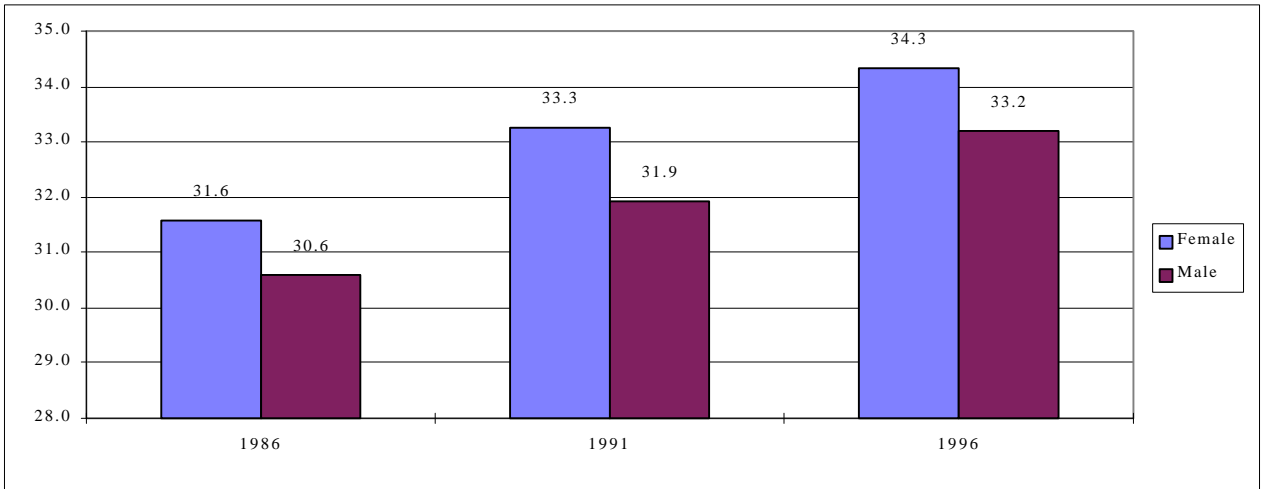


Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 1.15: Age Profiles of GTA Male and Female Populations



Exhibit 1.16: Median Age of GTA Male and Female Populations



1.3 SUMMARY OF TRENDS AND PERSON TRAVEL DEMAND IMPLICATIONS

1.3.1 Trends

The most notable changes observed in the above demographic characteristics are summarised in Exhibit 1.17.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 1.17: Summary of Demographic Characteristics (1986-1996)

	1986	1991	1996	Change ¹			Comments
				1986-91	1991-96	1986-96	
GTA Households and Population							
Number of households (millions)	1.47	1.66	1.81	13.0%	9.0%	23.1%	
Population (millions)	4.06	4.57	4.93	12.5%	7.8%	21.3%	
Population Distribution							
Percent of population residing in:							
Toronto or Hamilton-Wentworth	63.0%	58.2%	56.2%	-4.8%	-2.0%	-6.8%	Reduction mainly in Toronto
Durham, York, Peel or Halton	37.0%	41.8%	43.8%	4.8%	2.0%	6.8%	Increase mainly in York & Peel
Household Size							
Percent of 1-person households	19.3%	20.1%	21.7%	0.8%	1.6%	2.4%	
Number of persons per household	2.77	2.76	2.73	-0.4%	-1.1%	-1.5%	
Age							
Percent of population aged 16-30	27.4%	24.2%	21.2%	-3.2%	-3.0%	-6.2%	
Percent of population aged 31-50	30.3%	32.5%	34.6%	2.2%	2.1%	4.3%	
Percent of population aged 66 or over	7.2%	8.6%	9.1%	1.4%	0.5%	1.9%	
Median age of Population	31.1	32.5	33.8	4.6%	4.0%	8.8%	

¹ The change in any “Percent” from year 1 to year 2 is calculated as the Percent in year 2 minus that in year 1. Otherwise (e.g. population), the change is calculated as the percentage change, that is, the number in year 2 minus the number in year 1 divided by the number in year 1.

1.3.2 Implications

Some person travel demand implications based on the above demographic trends include:

- increase in total travel due to the increase in the GTA population;
- increased dependence on auto in relation to the faster growth in the regions of Durham, York, Peel and Halton which are characterised by more dispersed urban activities and less developed transit systems than Toronto and Hamilton-Wentworth;
- increased proportion of household-based discretionary trips (e.g. shopping trips), due to the faster growth rate of households than persons;
- fewer car-pooling opportunities in relation to the reduced household size;
- increased per-capita trip rate and auto travel share since the “Baby Boom” generation entered entirely into the age of highest auto trip-making rate;
- reduced transit mode split due to the reduction in the proportion of young persons (aged 16 to 30) who are more prone to take transit than other age cohorts; and
- increased proportion of discretionary travel in relation to the increase in the proportion of persons aged 66 or above.

As shown earlier, immigrants to the GTA are aged mostly between 11 and 50, which plays a role in shaping the age profile of the GTA population and its transportation patterns. Many of these immigrants correspond to the low scale of income and are likely transit dependent. Therefore, the pattern of increased auto share noted above could be partly mitigated by the transit dependent immigrants.

2. SOCIO-ECONOMIC CHARACTERISTICS

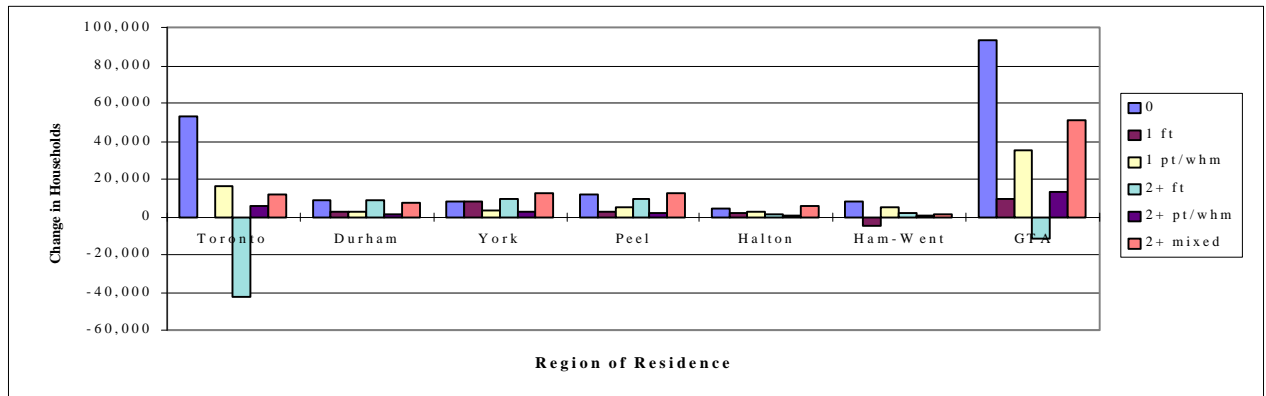
Socio-economic characteristics in this study refer to the attributes related to employment status and type. The employed labour force is a key market sector in travel demand analysis since it generates the majority of travel made during the peak periods. Hence, this chapter focuses on changes in socio-economic characteristics in the GTA. Information on occupation type were not collected in the 1986 and 1991 waves of the TTS. Due to its importance in the analysis of travel demand, the 1996 characteristics of occupation type are dealt with in a separate section in this chapter.

2.1 HOUSEHOLD CHARACTERISTICS

2.1.1 Number and Employment Status of Household Workers

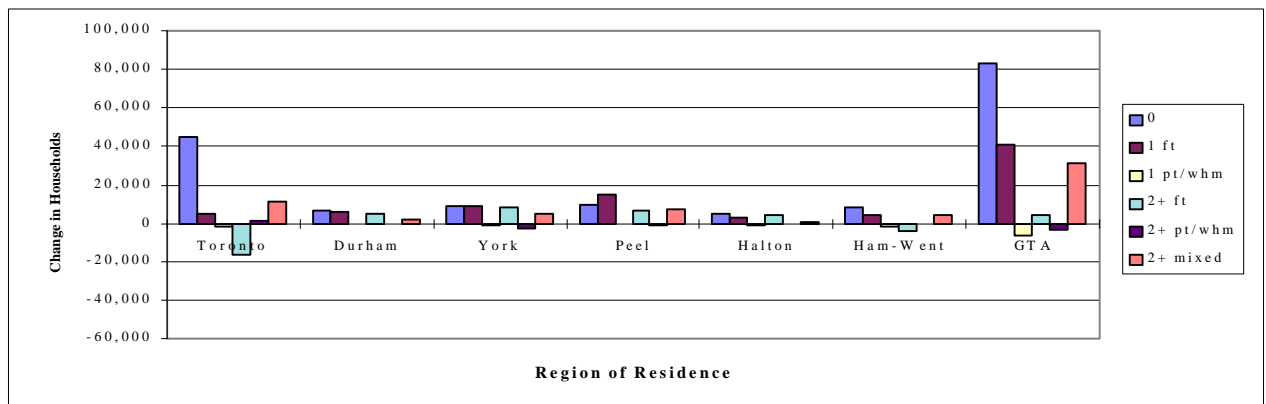
Shown in Exhibits 2.1 and 2.2 are the changes in the number of households by status and number of household workers during the periods 1986-1991 and 1991-1996, respectively.

Exhibit 2.1: Change in Households by Employment Status¹ and Number of Household Workers - 1986-1991



1. ft: full time; pt: part time; whm: work at home; mixed: household with at least one full-time worker and at least one part-time/work-at-home worker

Exhibit 2.2: Change in Households by Employment Status and Number of Household Workers - 1991-1996



Exploring Person Travel Trends in the Greater Toronto Area

Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

The four household types that dominate the GTA include households with no workers, one full-time worker, two or more full-time workers, or mixed workers (i.e. at least one full-time worker plus at least one part-time/work-at-home worker). These households constitute about 95% of the GTA households, with the remaining 5% of households having only part-time/work-at-home workers.

Even though only 16% of all households in 1986 contained no workers, such households constituted nearly 50% of the 190,000 new households added in the following five years. In the five years from 1991 to 1996, the growth in households with no workers constituted 56% of the total GTA growth in households. The number of households with one full-time worker increased between 1986 and 1991 at a rate smaller than the growth rate of total GTA households. However, these households increased in number in the following five years at a rate equal to that of total GTA households. The growth rate in the number of mixed-worker households (at least one full-time worker plus at least one part-time/work-at-home worker) was higher than the corresponding growth rate of total GTA households in each five-year period. The number of households with one part-time/work-at-home worker and the number of households with at least two part-time/work-at-home workers both increased in the first five years but dropped in the following five years. However, the drop was smaller than growth in the preceding five years, resulting in both types of household experiencing a relatively small net growth in the past ten years. In contrast, the number of households with two or more full-time workers dropped in the first five-year period but recovered to some degree in the next five years, resulting in a net reduction in the number of households from 1986 to 1996.

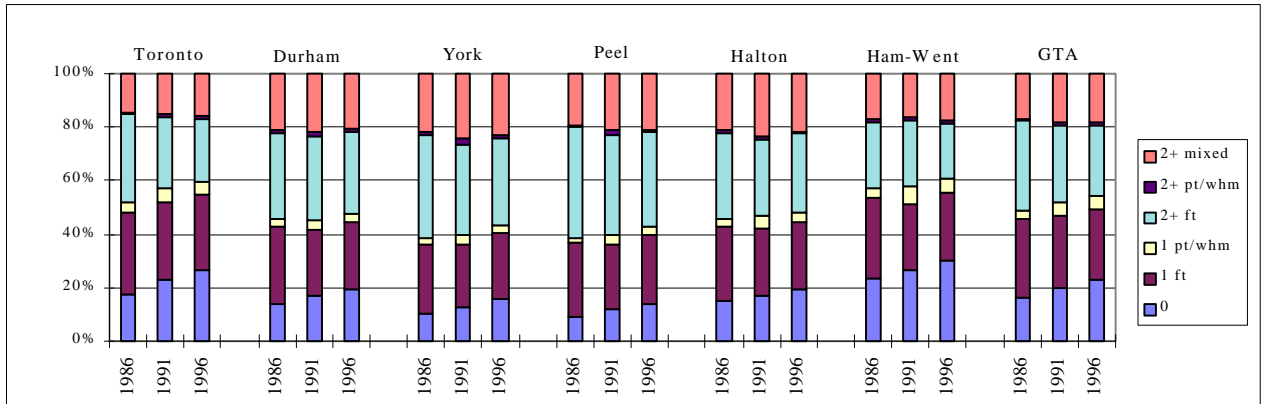
The above changes in the number and status of household workers were primarily due to the economic recession that hit most of Canada in the early 1990's, as will be noted later in this report.

Most of Toronto's growth in the two five-year periods was in households with no workers, while it experienced a substantial reduction in the number of households with two or more full-time workers which was offset partially by an increase in the number of mixed-worker households. In the 905 Belt, the numbers of the four major household types generally increased in the two five-year periods, at varying growth rates. Households with no workers had the largest growth rate, followed by households with two or more mixed-worker households while households with one full-time worker and households with at least two full-time workers had a lower growth rate.

Shown in Exhibit 2.3 is the distribution of households by number and status of workers. Overall, there was a substantial increase in the proportion of GTA households with no workers from 16% in 1986 to 23% in 1996. During the same period, the proportion of households with one worker decreased slightly from 33% in 1986 to 32% in 1996. In fact, the proportion of households with one part-time/work-at-home worker increased slightly while the proportion of households with one full-time worker decreased, resulting in the net reduction in the proportion of households with one worker. The proportion of households with at least two workers decreased substantially from 51% in 1986 to 46% in 1996. Similar to one-worker households, the proportion of households with at least two full-time workers decreased substantially while the proportion of two-worker households with at least one part-time/work-at-home worker increased slightly. Similar trends can be observed in the six regions. However, Toronto experienced the largest increase in the proportion of 0-worker households and the largest reduction in the proportion of households with at least two workers, compared to the other GTA regions.

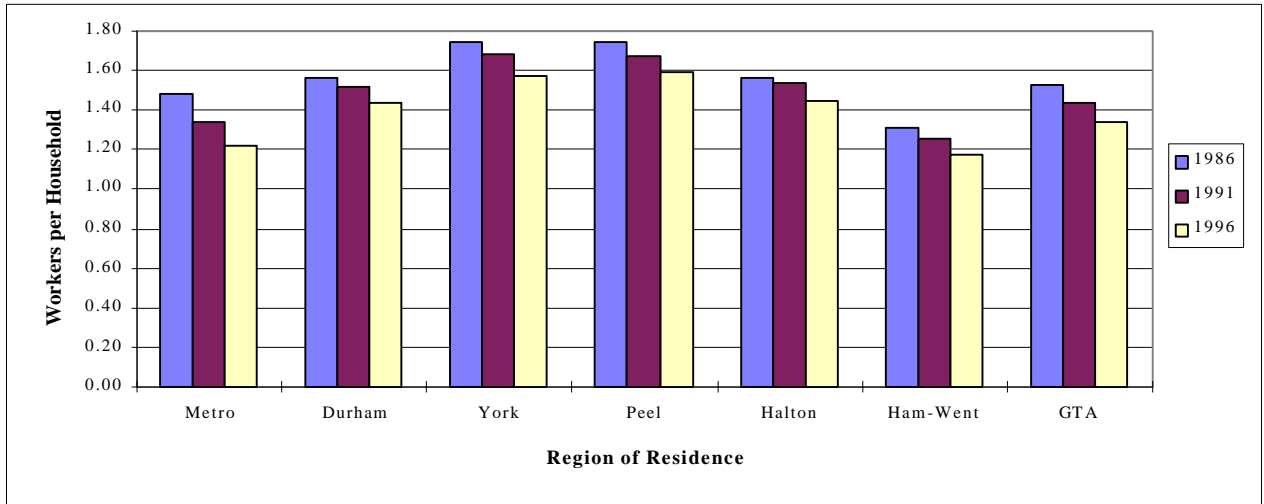
Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 2.3: Distribution of Households by Status and Number of Household Workers



As shown in Exhibit 2.4, the above changes resulted in decline in the average number of household workers in the GTA from 1.53 in 1986 to 1.44 in 1991 and 1.34 in 1996. The largest reduction was experienced in Toronto where the average number of household workers dropped from 1.48 in 1986 to 1.22 in 1996. However, the other regions experienced reduction in the number of household workers as well, particularly York and Peel.

Exhibit 2.4: Average Number of Household Workers



2.1.2 Composition of Household

Household composition with respect to size is addressed in Chapter 1, and household composition with respect to status and number of household workers is addressed in the preceding section. In this section, an attempt is made to develop a classification that describes household composition using both demographic and socio-economic characteristics of the household. A few classifications were initially examined and evaluated based on their distributions and whether household classes had reasonably distinct attributes. The classification shown in Exhibit 2.5 was the chosen classification to describe household composition.

Household composition is defined here by a combination of the household size, the number of workers per household and the number of pre-schoolers plus the number of students per household. The latter measure

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

(i.e. the number of pre-schoolers plus the number of students per household) provides an estimate of the number of junior dependants in a family. Exhibit 2.5 shows the distribution of this household classification in the years 1986, 1991 and 1996. The shaded boxes indicate the largest 5 categories in each survey year. Exhibit 2.6 shows the change in the number of households within each category between 1986 and 1991 and between 1991 and 1996.

Exhibit 2.5: Distribution of Household Composition

Households GTA %	1986									
Household Workers:	Household Size, Number of Preschoolers+ Number of Students per Household									
	1,0	1,1	2,0	2,1	2,2	3+ ,0	3+ ,1	3+ ,2	3+ ,3+	Total
0	105,530 7.2%	5,537 0.4%	97,432 6.6%	6,107 0.4%	2,645 0.2%	4,129 0.3%	3,987 0.3%	5,349 0.4%	4,572 0.3%	235,286 16.0%
1	168,489 11.5%	3,181 0.2%	91,594 6.2%	28,633 2.0%	1,122 0.1%	19,873 1.4%	49,890 3.4%	81,060 5.5%	38,841 2.6%	482,685 32.9%
2	NA	NA	216,093 14.7%	7,699 0.5%	726 0.0%	40,290 2.7%	113,642 7.8%	132,543 9.0%	47,639 3.2%	558,631 38.1%
3+	NA	NA	NA	NA	NA	76,418 5.2%	53,088 3.6%	39,518 2.7%	20,451 1.4%	189,475 12.9%
Total	274,019 18.7%	8,718 0.6%	405,119 27.6%	42,439 2.9%	4,493 0.3%	140,710 9.6%	220,607 15.0%	258,470 17.6%	111,503 7.6%	1,466,077
Households GTA %	1991									
Household Workers:	Household Size, Number of Preschoolers+ Number of Students per Household									
	1,0	1,1	2,0	2,1	2,2	3+ ,0	3+ ,1	3+ ,2	3+ ,3+	Total
0	151,909 9.2%	5,541 0.3%	126,012 7.6%	8,653 0.5%	3,309 0.2%	6,037 0.4%	6,425 0.4%	10,127 0.6%	10,799 0.7%	328,812 19.9%
1	172,025 10.4%	2,777 0.2%	109,467 6.6%	31,910 1.9%	835 0.1%	27,700 1.7%	55,265 3.3%	85,703 5.2%	41,490 2.5%	527,172 31.8%
2	NA	NA	231,087 14.0%	6,958 0.4%	540 0.0%	46,137 2.8%	122,595 7.4%	146,229 8.8%	54,827 3.3%	608,373 36.7%
3+	NA	NA	NA	NA	NA	69,714 4.2%	52,756 3.2%	46,974 2.8%	21,882 1.3%	191,326 11.6%
Total	323,934 19.6%	8,318 0.5%	466,566 28.2%	47,521 2.9%	4,684 0.3%	149,587 9.0%	237,042 14.3%	289,032 17.5%	128,998 7.8%	1,655,683
Households GTA %	1996									
Household Workers	Household Size, Number of Preschoolers+ Number of Students per Household									
	1,0	1,1	2,0	2,1	2,2	3+ ,0	3+ ,1	3+ ,2	3+ ,3+	Total
0	178,502 9.9%	10,035 0.6%	147,930 8.2%	13,930 0.8%	6,001 0.3%	9,259 0.5%	9,977 0.6%	18,230 1.0%	17,949 1.0%	411,812 22.8%
1	197,622 10.9%	4,698 0.3%	106,393 5.9%	38,193 2.1%	1,391 0.1%	34,112 1.9%	58,271 3.2%	96,488 5.3%	50,899 2.8%	588,065 32.6%
2	NA	NA	219,763 12.2%	7,662 0.4%	817 0.0%	46,587 2.6%	135,008 7.5%	165,014 9.1%	59,263 3.3%	634,113 35.1%
3+	NA	NA	NA	NA	NA	67,568 3.7%	46,567 2.6%	38,200 2.1%	18,696 1.0%	171,031 9.5%
Total	376,124 20.8%	14,733 0.8%	474,086 26.3%	59,785 3.3%	8,208 0.5%	157,526 8.7%	249,822 13.8%	317,931 17.6%	146,806 8.1%	1,805,021

Exploring Person Travel Trends in the Greater Toronto Area
Part I: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 2.6: Change in Household Composition

Change % Change % of Growth	1986-1991									
	Household Size, Number of Preschoolers+ Number of Students per Household									
Household Workers:	1,0	1,1	2,0	2,1	2,2	3+,0	3+,1	3+,2	3+,3+	Total
0	46,379 43.9% 24.5%	4 0.1% 0.0%	28,581 29.3% 15.1%	2,546 41.7% 1.3%	665 25.1% 0.4%	1,908 46.2% 1.0%	2,438 61.2% 1.3%	4,778 89.3% 2.5%	6,227 136.2% 3.3%	93,526 39.8% 49.3%
1	3,537 2.1% 1.9%	-404 -12.7% -0.2%	17,872 19.5% 9.4%	3,277 11.4% 1.7%	-287 -25.6% -0.2%	7,827 39.4% 4.1%	5,375 10.8% 2.8%	4,642 5.7% 2.4%	2,649 6.8% 1.4%	44,487 9.2% 23.5%
2	NA	NA	14,994 6.9% 7.9%	-741 -9.6% -0.4%	-186 -25.6% -0.1%	5,847 14.5% 3.1%	8,953 7.9% 4.7%	13,686 10.3% 7.2%	7,188 15.1% 3.8%	49,742 8.9% 26.2%
3+	NA	NA	NA	NA	NA	-6,704 -8.8% -3.5%	-332 -0.6% -0.2%	7,456 18.9% 3.9%	1,431 7.0% 0.8%	1,851 1.0% 1.0%
Total	49,915 18.2% 26.3%	-400 -4.6% -0.2%	61,447 15.2% 32.4%	5,082 12.0% 2.7%	192 4.3% 0.1%	8,877 6.3% 4.7%	16,434 7.4% 8.7%	30,563 11.8% 16.1%	17,495 15.7% 9.2%	189,607 12.9% 100%

Change % Change % of Growth	1991-1996									
	Household Size, Number of Preschoolers+ Number of Students per Household									
Household Workers:	1,0	1,1	2,0	2,1	2,2	3+,0	3+,1	3+,2	3+,3+	Total
0	26,593 17.5% 17.8%	4,494 81.1% 3.0%	21,917 17.4% 14.7%	5,277 61.0% 3.5%	2,692 81.3% 1.8%	3,222 53.4% 2.2%	3,552 55.3% 2.4%	8,103 80.0% 5.4%	7,150 66.2% 4.8%	83,000 25.2% 55.6%
1	25,596 14.9% 17.1%	1,921 69.2% 1.3%	-3,074 -2.8% -2.1%	6,283 19.7% 4.2%	555 66.5% 0.4%	6,412 23.1% 4.3%	3,006 5.4% 2.0%	10,785 12.6% 7.2%	9,408 22.7% 6.3%	60,893 11.6% 40.8%
2	NA	NA	-11,324 -4.9% -7.6%	703 10.1% 0.5%	277 51.2% 0.2%	450 1.0% 0.3%	12,413 10.1% 8.3%	18,785 12.8% 12.6%	4,436 8.1% 3.0%	25,740 4.2% 17.2%
3+	NA	NA	NA	NA	NA	-2,146 -3.1% -1.4%	-6,189 -11.7% -4.1%	-8,775 -18.7% -5.9%	-3,186 -14.6% -2.1%	-20,296 -10.6% -13.6%
Total	52,190 16.1% 34.9%	6,415 77.1% 4.3%	7,519 1.6% 5.0%	12,263 25.8% 8.2%	3,524 75.2% 2.4%	7,939 5.3% 5.3%	12,781 5.4% 8.6%	28,898 10.0% 19.4%	17,808 13.8% 11.9%	149,338 9.0% 100%

In 1986, almost 19% of all GTA households were occupied by single persons, mostly non-student adults. Households occupied by two persons constituted almost 31% of all GTA households. The vast majority of these households contained no junior dependants. Households occupied by three or more persons constituted the other 50% of GTA households. Of these 50%, households without junior dependants represented 10% and households with junior dependants represented 40% of all GTA households. 11.5% of all GTA households were occupied by single persons who worked and 7.2% were occupied by single persons who didn't work. Households occupied by two persons, both working, constituted the largest proportion (14.7%) of GTA households in 1986. Two-person households with one of the two persons only working constituted 6.2% and households with none of the two persons working constituted 6.6% of all GTA households. Other significant household compositions were represented by households occupied by at least 3 persons, two of whom worked. Such households with one dependent constituted 7.8% and households with two junior dependants constituted 9% of all GTA households.

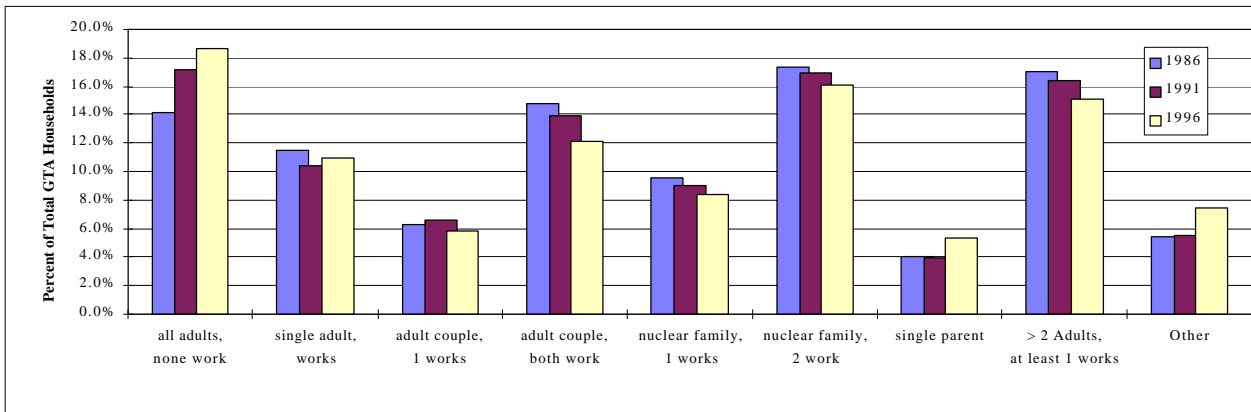
Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 2.6 shows that almost one quarter of the growth in all GTA households between 1986 and 1991 was due to the increase in households occupied by single persons who were not working. The household composition with the next largest growth between 1986 and 1991 was represented by households occupied by two persons, none of whom was working. The increase in these households constituted 15% of the growth in all GTA households. These two household compositions (i.e. non-working single-person and two-person households) continued to constitute large proportions of the growth in GTA households between 1991 and 1996 (18% and 15%, respectively). Households occupied by single working persons increased slightly between 1986 and 1991, but increased substantially in the next five years. In contrast, the number of two-person households with no junior dependants and at least one person was working increased fairly substantially between 1986 and 1991 but decreased in the following five years. Households with two workers and at least three persons, two of whom were junior dependants, fairly increased in number between 1986 and 1991 but increased even more in the past five years. Households with two workers and at least three persons, one of whom was junior dependent showed similar patterns of change as shown in the exhibit. The exhibits also show a notable increase in two-person households with one junior dependent, representing single-parent families, particularly between 1991 and 1996, where the increase represented 8.2% of the total growth in GTA households.

The above resulted in changes in the distribution of household composition in 1991 and 1996, as shown in Exhibit 2.5. The most notable changes include the increase in the proportion of single non-working person households from 7.2% in 1986 to 9.2% in 1991 and 9.9% in 1996. Similarly the proportion of non-working two-person households increased from 6.6% in 1986 to 7.6% in 1991 and 8.2% in 1996. Other notable changes include the reduction in the proportions of single working-person households and households occupied by two persons, both working.

Exhibit 2.7 presents a summary distribution of the GTA household composition in 1986, 1991 and 1996. It shows that the proportion of households occupied by adults only, none of whom worked or studied, increased substantially from 14% in 1986 to 19% ten years later. About 97% of these households were single- or two-person households. Between 1986 and 1996, almost every other household type reduced in proportion, with the exception of single-parent households. The proportion of households of two adults only, both working, reduced more than any other household type (from 14.7% in 1986 to 12.2% in 1996), followed by households of more than two adults, of whom one at least worked (from 17.1% in 1986 to 15.2% in 1996).

Exhibit 2.7: Summary Distribution of Household Composition

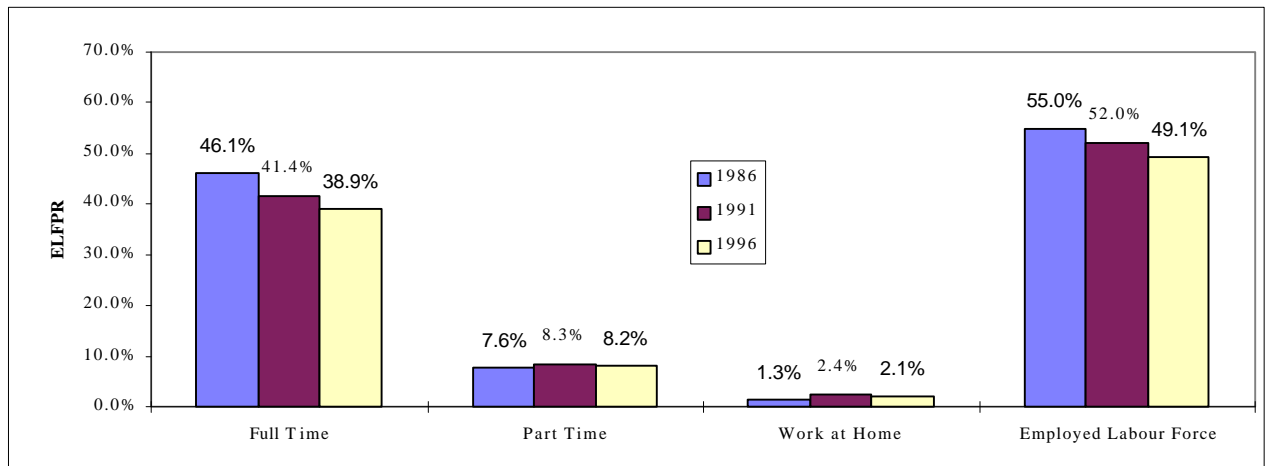


2.2 EMPLOYED LABOUR FORCE CHARACTERISTICS

2.2.1 Employed Labour Force Participation Rate

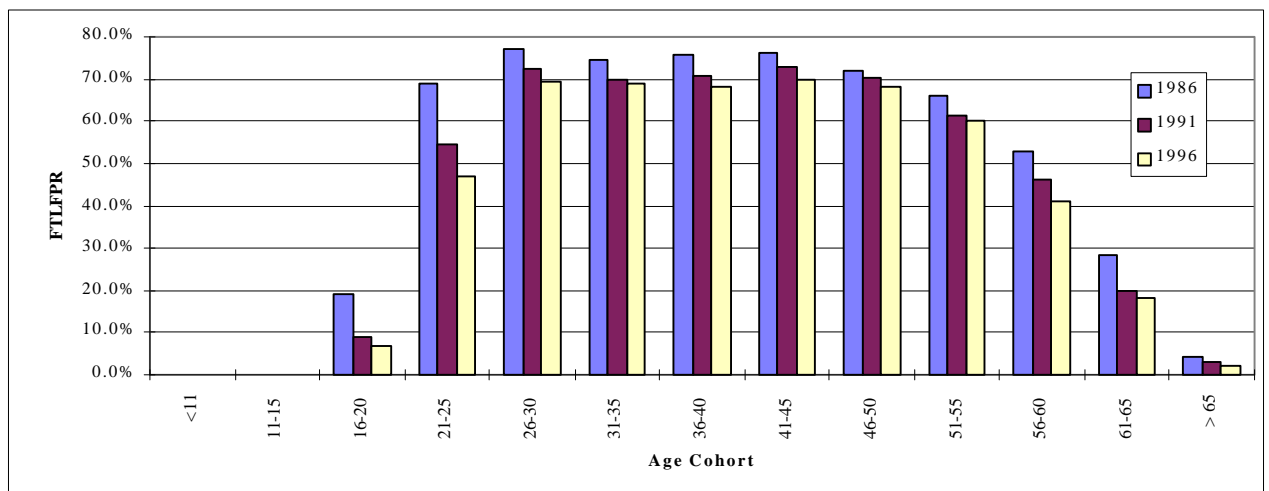
As shown in Exhibit 2.8, the Employed Labour Force Participation Rate (ELFPR), measured as the percent employed of the entire population, declined from 55% in 1986 to 52% in 1991 and declined again to 49% in 1996. Most of the decline was in full-time jobs, whereas participation in part-time and work-at-home jobs increased between 1986 and 1991, then declined slightly in the following five years. The decline in ELFPR was primarily due to the economic recession that hit most of Canada in the early 1990's.

Exhibit 2.8: Employed Labour Force Participation Rate (ELFPR)



Exhibits 2.9-2.11 show the rate of labour force participation, by age, in full-time, part-time and work-at-home jobs, respectively.

Exhibit 2.9: Full-Time Labour Force Participation Rate (FTLFPR) by Age



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 2.10: Part-Time Labour Force Participation Rate (PTLFPR) by Age

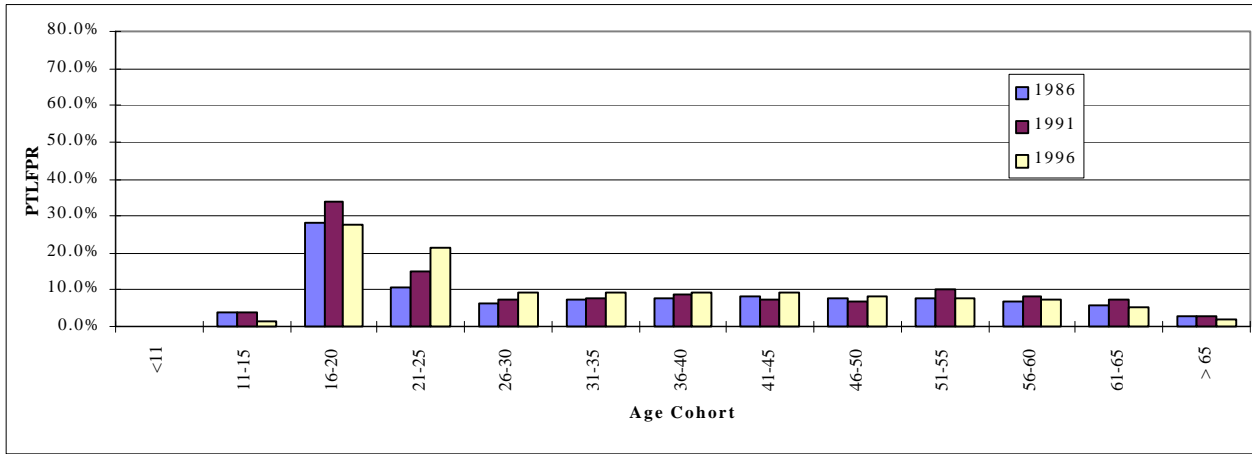
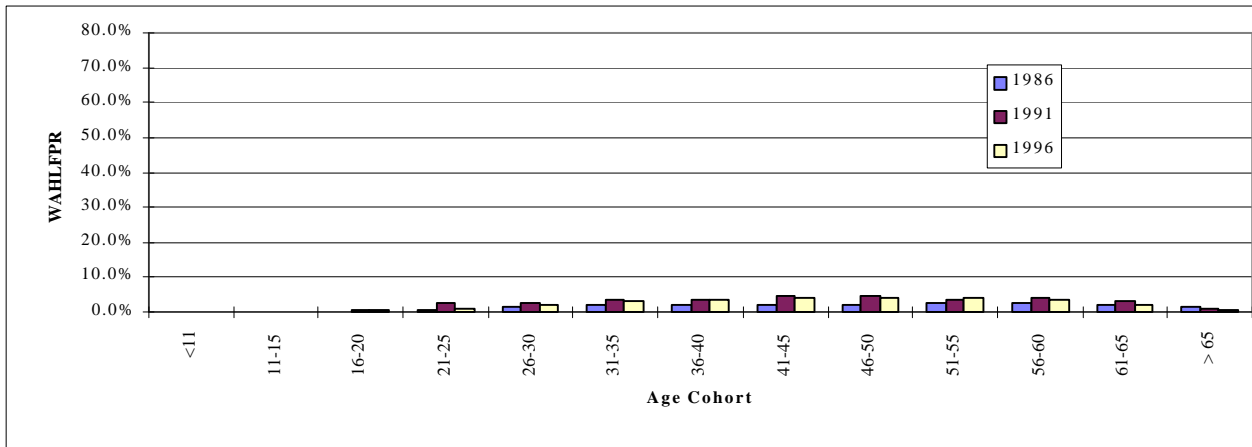


Exhibit 2.11: Work-at-Home Labour Force Participation Rate (WAHLFPR) by Age



The largest change occurred for persons of age 16 to 25. Not only did their overall ELFPR drop from 66% in 1986 to 53% in 1996, but the decline was more severe in full-time job participation (28% in 1996 vs. 47% in 1986), whereas participation in part-time jobs had actually increased (24% in 1996 vs. 18% in 1986). This occurred despite the fact that their population reduced in size between 1986 and 1996 as observed in Chapter 1. The next most affected by the recession were persons aged between 51 and 65 who experienced a decline in ELFPR from 59% in 1986 to 51% in 1996, while the effect on mid-age persons (i.e. 26 to 50) was restricted to the decline of ELFPR from 85% in 1986 to 81% in 1996. All the decline was in full-time jobs. Exhibit 2.11 shows that participation in work-at-home jobs increased across all age cohorts between 1986 and 1991 but declined slightly in most age cohorts in the past five years.

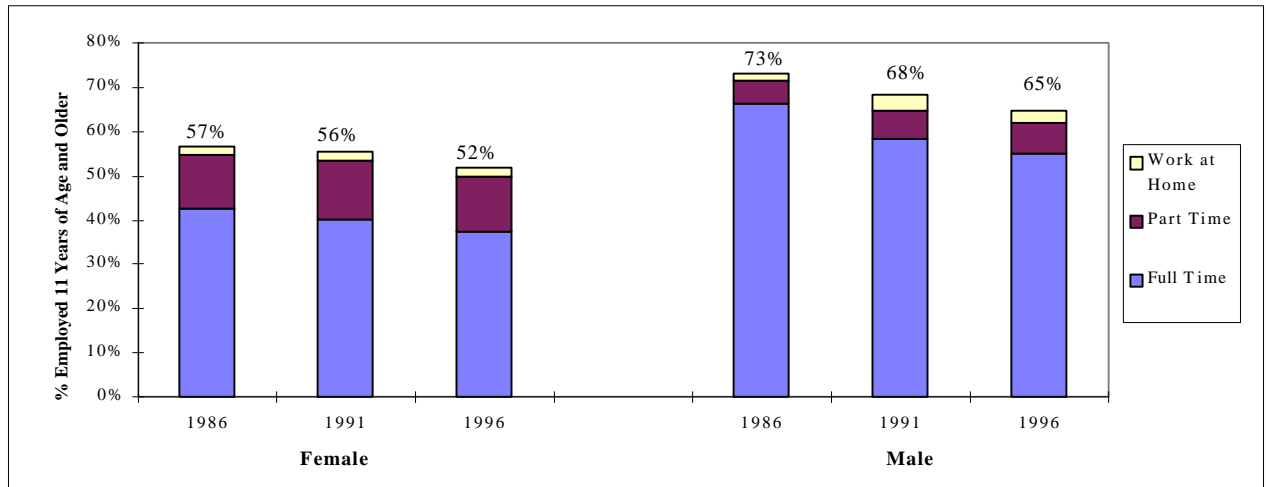
The above observations suggest that the age of entrance into the full-time workforce increased in the 1986-1996 decade. It is also observed that employment participation rate varies by age and status of employment. For example, full-time employment participation rate is highest for persons aged between 26 and 55. In contrast, part-time employment participation rate is highest for persons of young age, particularly between 16 and 20. In TTS 1991 and TTS 1996, information on employment and student status for persons younger than 11 years of age were not collected and these persons were assumed to be unemployed. Therefore, it is

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

more appropriate to measure ELFPR as the percent of the population aged 11 and older which have employment.

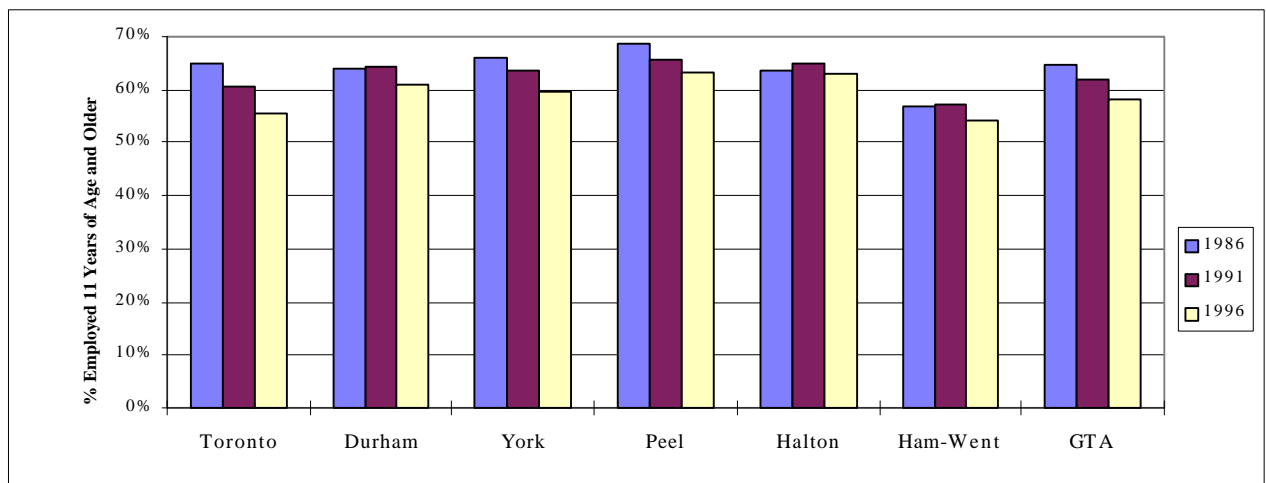
As Exhibit 2.12 shows, females experienced less reduction in ELFPR than males. However, employment participation by males declined more between 1986 and 1991 (73% to 68%) than during the following five years, and employment participation by females declined more between 1991 and 1996 than during the previous five years. The exhibit also shows females to participate more in part-time jobs than males.

Exhibit 2.12: Employed Labour Force Participation Rate by Gender



As shown in Exhibit 2.13, the residents of Toronto, having one of the highest regional ELFPR in 1986, experienced a larger reduction in ELFPR compared to the other regions. (i.e. 56% in 1996 vs. 65% in 1986). By 1996, Toronto became the second lowest region, before Hamilton-Wentworth, in terms of ELFPR. The residents of other regions experienced reductions in participation rate as well, but not as much as the Toronto residents.

Exhibit 2.13: Employed Labour Force Participation Rate by Region of Residence



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

2.2.2 Residential Location Distribution

The changes in population size, discussed in Chapter 1, and employed labour force participation rate, discussed in the preceding section, resulted in changes in the size and characteristics of the employed labour force. This and the next few sections deal with these changes.

Exhibit 2.14 presents the employed labour force in 1986, 1991 and 1996, by employment status and region of residence, and Exhibit 2.15 shows the regional distribution of the employed labour force.

Exhibit 2.14: Employed Labour Force by Status and Region of Residence

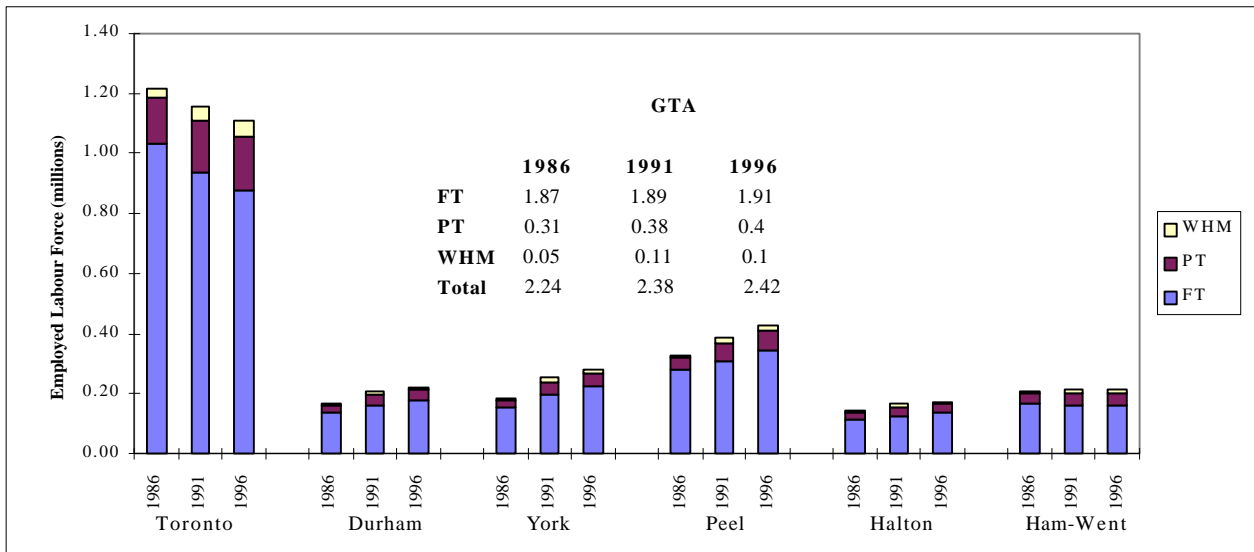
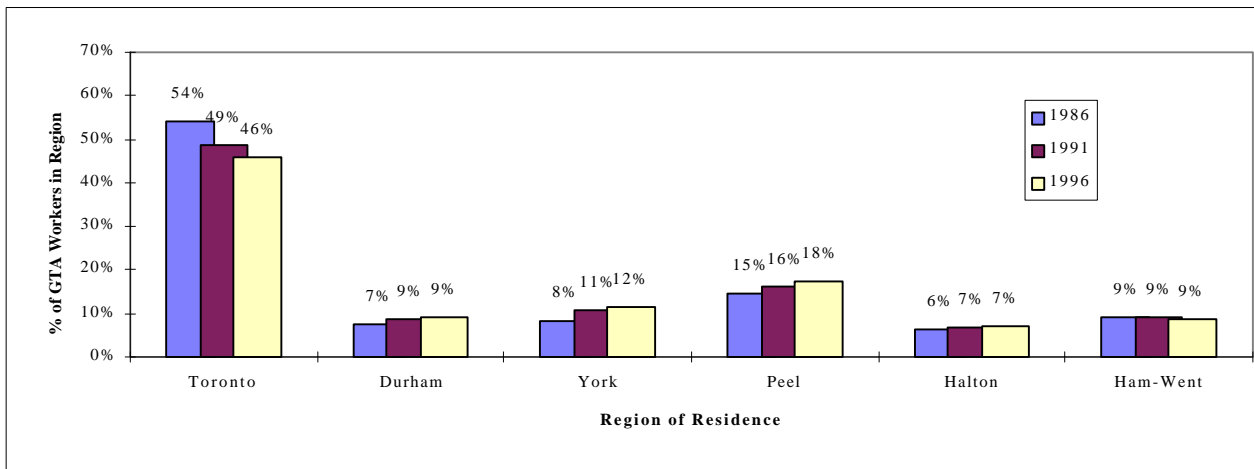


Exhibit 2.15: Distribution of Employed Labour Force by Region of Residence



While the GTA population increased by 12.5% between 1986 and 1991, the employed labour force increased by only 6%. Between 1991 and 1996, the GTA population increased by 7.8% while the employed labour force increased by only 2%. The GTA employed labour force in 1996 was slightly more than 2.4 million.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Even though part-time workers in 1986 constituted only 14% of the entire workforce, the growth in the GTA part-time labour force in both five-year periods was higher than the growth in the full-time labour force. The growth in the work-at-home labour force increased substantially (by 55 thousand workers) between 1986 and 1991. However, the number of work-at-home workers declined between 1991 and 1996.

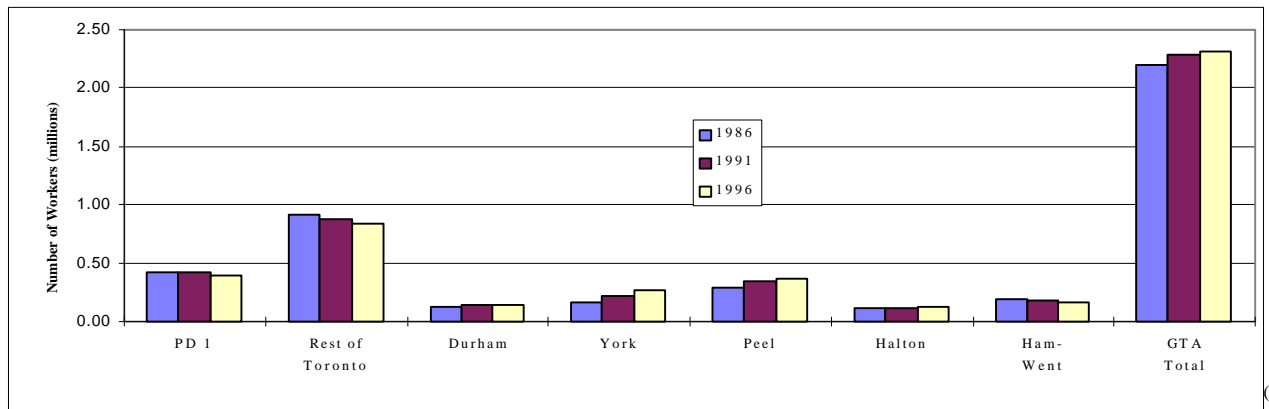
As mentioned in Chapter 1, the population of Toronto increased by 3.7% between 1986 and 1991 and by 4.1% between 1991 and 1996. Due to the relatively large drop in ELFPR noted in the preceding section, Toronto's labour force reduced in size by 5% between 1986 and 1991 and by 4% in the following five years. In fact, the reduction in the number of Toronto's full-time workers was even higher (-9% between 1986 and 1991 and -6% between 1991 and 1996), but this reduction was offset partially by an increase in the number of part-time and work-at-home workers. The patterns of change in the labour force residing in Hamilton-Wentworth were similar, albeit less in magnitude, to those observed in Toronto. In contrast to Toronto and Hamilton-Wentworth, the larger percentage increase in the population of the other four regions and the smaller reduction in ELFPR resulted in a net increase in their labour force.

In 1996, Toronto was home to 46% of all workers in the GTA, down from 54% 10 years earlier. During the same period, the proportion of the workforce residing in each 905-Belt region increased, with the exception of Hamilton where it remained constant. The proportion of the workforce residing in York experienced the largest increase (12% in 1996 vs. 8% in 1986), followed by the proportion of the workforce residing in Peel (18% in 1996 vs. 15% in 1986). As a result of these changes, Peel strengthened its second position, after Toronto, in terms of labour force size, York rose to the third position, while Hamilton-Wentworth slipped from the third position in 1986 to share the fourth position with Durham in 1996.

2.2.3 Employment Location Distribution

Shown in Exhibits 2.16-2.17 are the number and distribution of workers by the region of employment location, respectively. Due to the significance of Planning District 1 (PD 1) which contains Toronto's Central Business District (CBD), it is separated from the rest of Toronto.

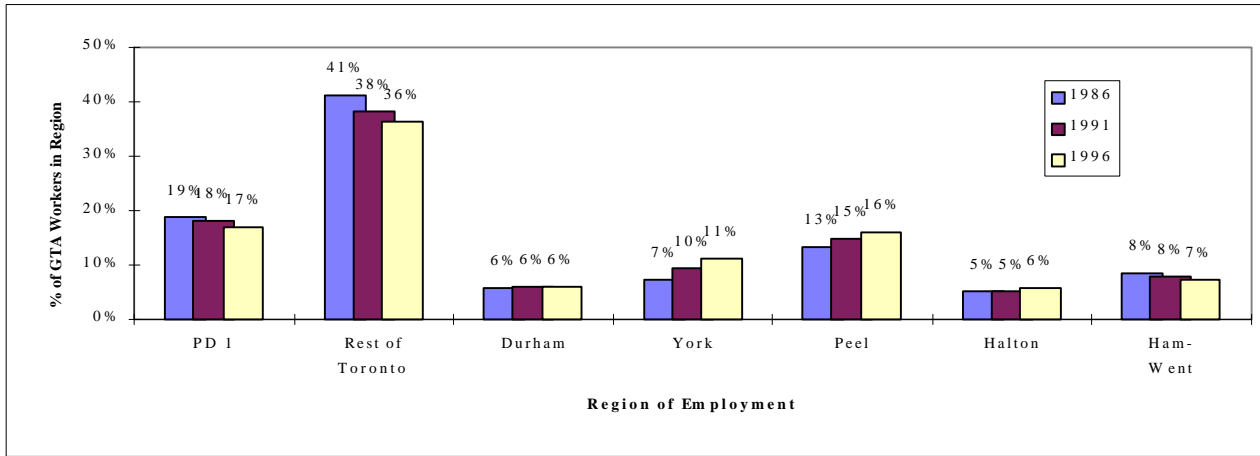
Exhibit 2.16: Employed Labour Force by Region of Employment⁽¹⁾



¹⁾ The 1986 values are obtained from Statistics Canada, Census of 1986. In 1991 and 1996, TTS data included the person's usual place of work, but not in 1986.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 2.17: Distribution of Employed Labour Force by Region of Employment



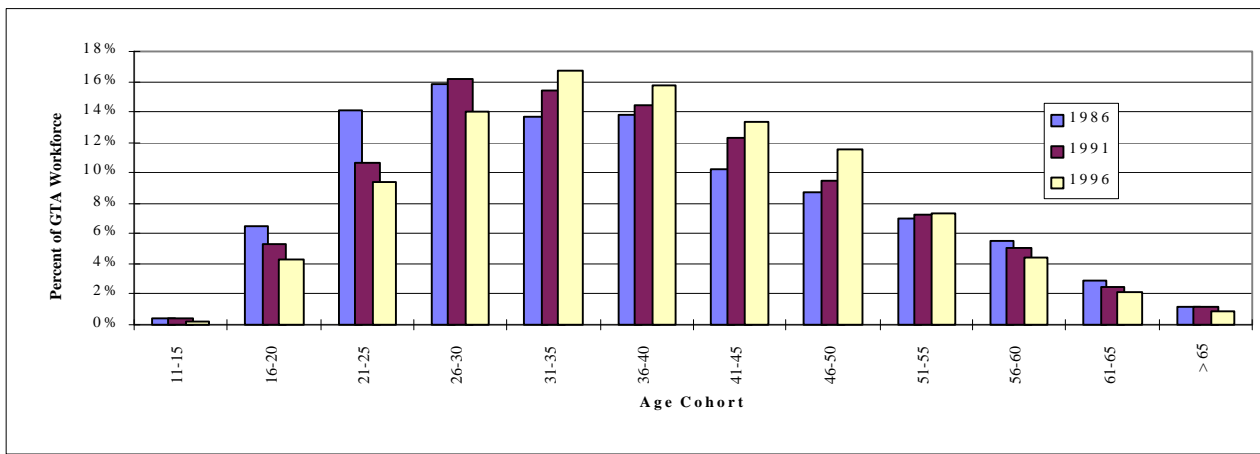
Employment in PD 1 remained almost constant between 1986 and 1991, but declined by more than 21,000 jobs in the next five years. Employment in the rest of Toronto declined in both periods, as did employment in Hamilton-Wentworth. In the other four regions, employment increased in both five-year periods, particularly in York and Peel regions.

These changes resulted in lower shares of GTA employment located in PD 1 (17% in 1996 vs. 18.8% in 1986), in rest of Toronto (36% in 1996 vs. 41.3%) and in Hamilton-Wentworth (7% in 1996 vs. 8.4% in 1986). During the same period, the shares of GTA employment in York and Peel increased steadily from 7.4% and 13.2% in 1986 to 11% and 16% in 1996, respectively.

2.2.4 Age

As a result of the reduction in population size of persons aged between 16 and 30 in the 1986-1996 decade and the relatively large reduction in ELFPR for persons in this age group, the percentage of the workforce in this age group dropped steadily from 36% in 1986 to 32% in 1991 and 28% in 1996. In contrast, the percentage of the workforce aged between 31 and 50 increased from 47% in 1986 to 52% in 1991 and 57% in 1996. The percentage of older workers, particularly those aged between 56 and 65, dropped from 8.4% in 1986 to 6.6% in 1996.

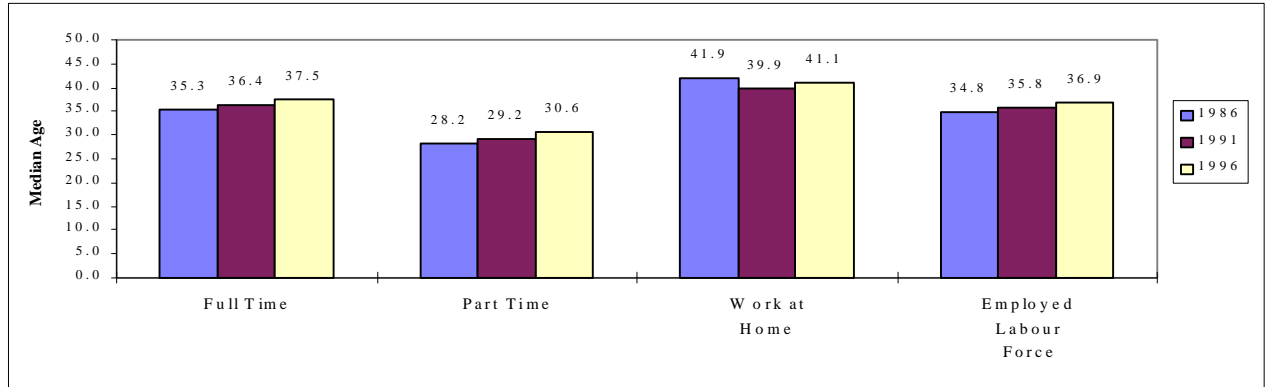
Exhibit 2.18: Distribution of Employed Labour Force by Age



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 2.19 shows that the median age of the employed labour force increased in the two five-year periods due to the ageing of the “Baby Boom” generation. As observed earlier, the median age of part-time workers is the smallest (30.6 in 1996), followed by the median age of full-time workers (37.5 in 1996), and the work-at-home arrangement seems to be the choice of older workers (median age was 41.1 in 1996).

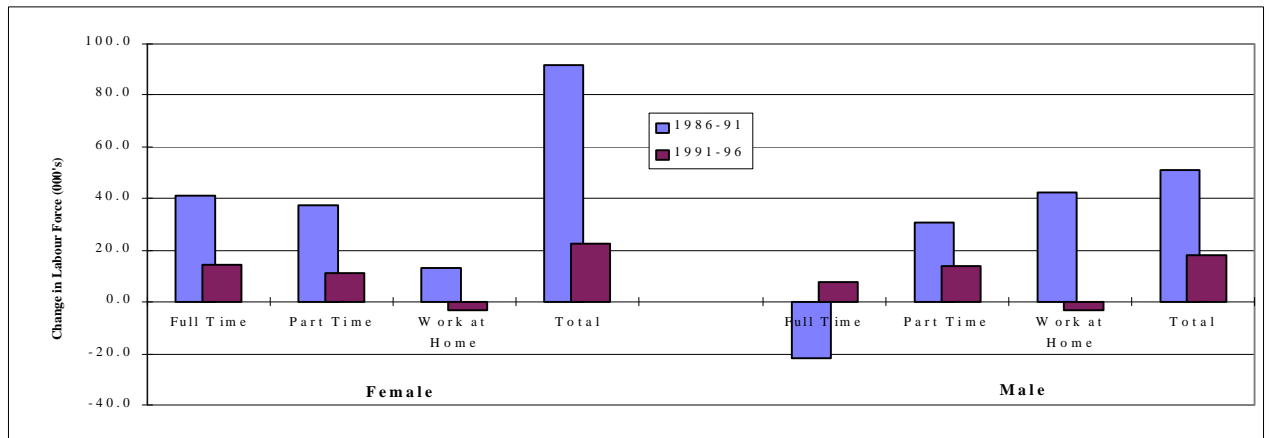
Exhibit 2.19: Median Age of Labour Force by Employment Status



2.2.5 Gender

In 1986, females constituted 45% of the employed labour force. However, they constituted the majority of part-time workers in the GTA (70%), while males constituted the majority of full-time workers (60%). As shown in exhibit 2.20, the increase in the female labour force exceeded the increase in male labour force in the two five-year periods. In fact, the male full-time labour force declined by 22,000 workers between 1986 and 1991 then increased slightly by 7,700 workers in the next five years. In contrast, the female full-time labour force increased by 41,300 workers between 1986 and 1991 and increased again by 14,500 workers in the next five years. The changes in the female part-time labour force in both periods were comparable to the changes in the male part-time labour force. The number of males working at home increased substantially by 42,300 between 1986 and 1991, but reduced slightly in the next five years. The number of females working at home increased by 13,000 between 1986 and 1996 and, like males, it decreased slightly in the following five years.

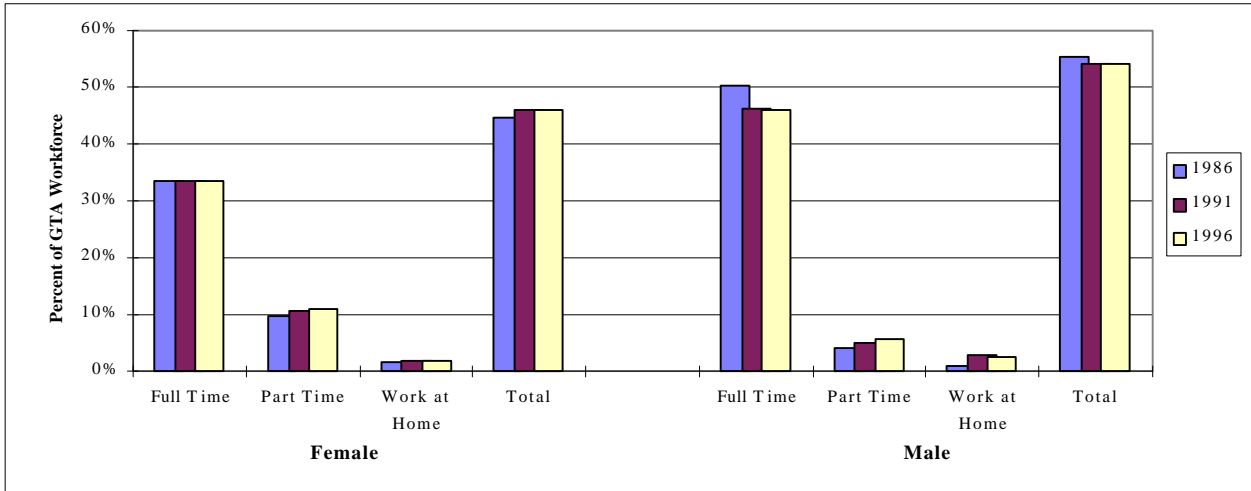
Exhibit 2.20: Change in Labour Force by Gender and Employment Status



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

These changes resulted in a slight increase in the female share of the labour force in 1996 to 46%, up from 45% in 1986, as shown in Exhibit 2.21. In fact, the 1% reduction in the male share of the labour force was the result of a reduction in the proportion of full-time male workers, from 50% in 1986 to 46% in 1996, offset partially by an increase in the proportions of part-time and work-at-home male workers. Similarly, the proportion of full-time female workers dropped slightly while the proportions of part-time and work-at-home female workers increased.

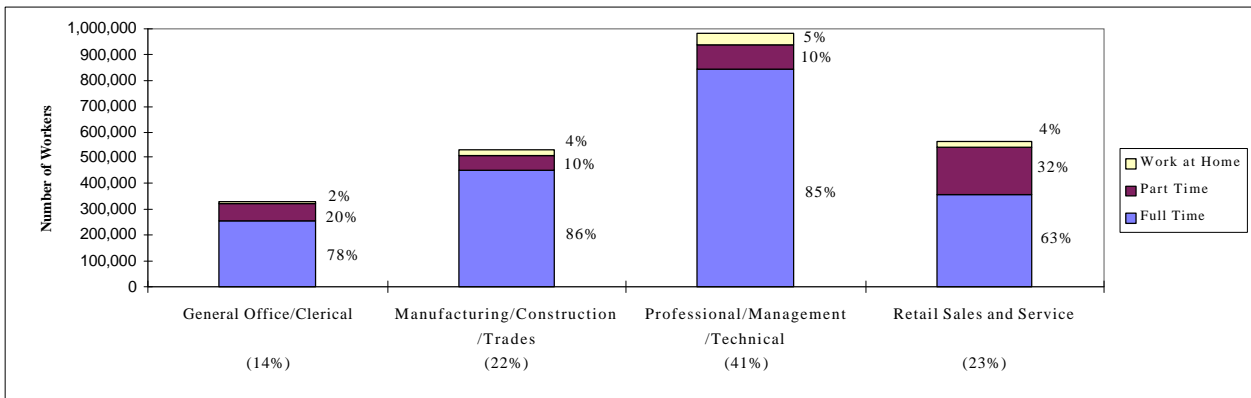
Exhibit 2.21: Distribution of Employed Labour Force by Gender and Employment Status



2.2.6 Occupation Type characteristics in 1996

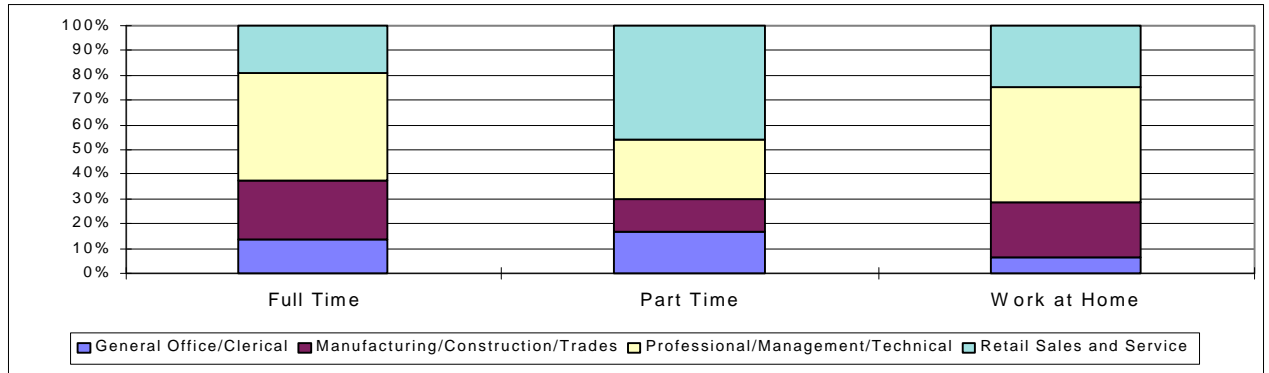
As shown in Exhibit 2.22, 14% of the GTA employed labour force in 1996 had general office/clerical (GOC) jobs, 22% had manufacturing/construction/trades (MCT) jobs, 41% had professional/management/technical (PMT) jobs and 23% had retail sales and service (RSS) jobs. In general, the majority of workers in each occupation type were full-time workers. However, there were larger percentages of part-time workers in occupation types GOC and RSS than in MCT and PMT. Exhibit 2.23 shows that nearly 46% of all part-time workers had RSS jobs and 24% had PMT jobs. For each of full-time and work-at-home workers the pattern was almost the opposite (i.e. more than 40% had PMT jobs while about 20% had RSS jobs).

Exhibit 2.22: 1996 Distribution of Occupation Type



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 2.23: 1996 Distribution of Occupation Type by Employment Status



Among all GTA workers, the median age of workers in RSS was the lowest (i.e. 34) while the median age of workers in PMT was the highest (i.e. 38.5), as shown in Exhibit 2.24. The median ages of workers in GOC and MCT were 36 and 37.4, respectively. Exhibit 2.25 shows that workers of age 25 or less work more in RSS than in any other occupation type, while older workers work more in PMT than in any other occupation type.

Exhibit 2.24: 1996 Median Age of GTA Workers by Occupation Type

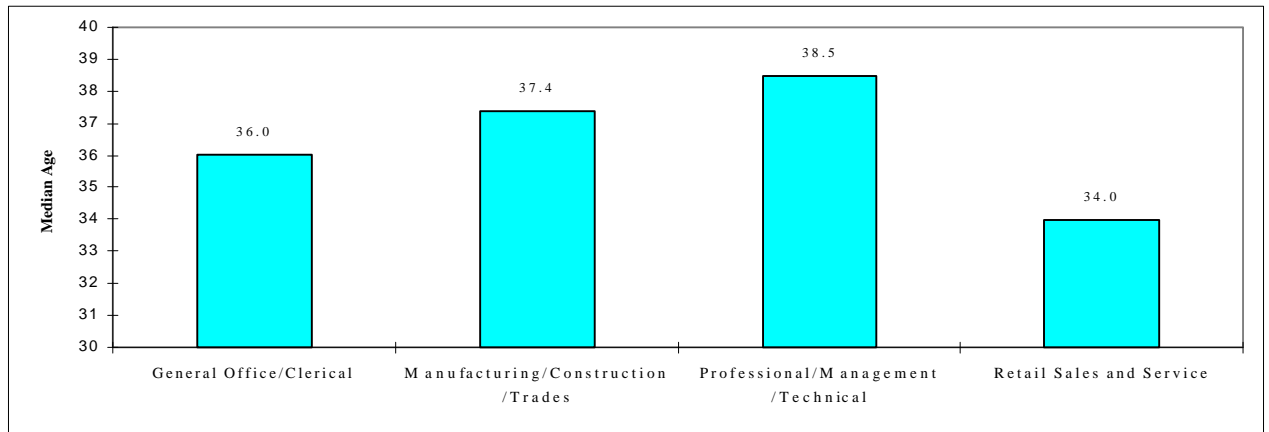
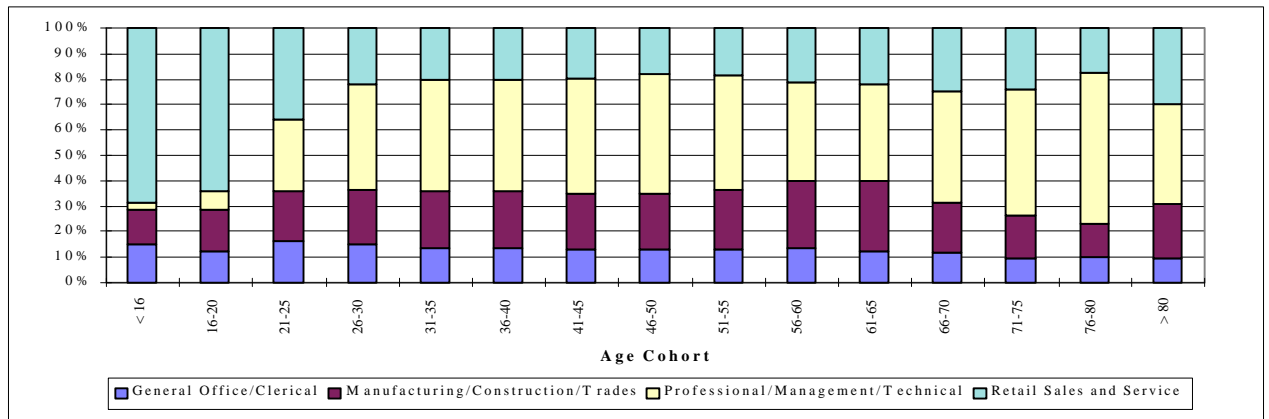


Exhibit 2.25: 1996 Distribution Of Workers' Occupation Type By Age



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

More than three quarters of workers in GOC were females while more than three quarters of workers in MCT were males, as shown in Exhibit 2.26. Males constituted slightly more than half of the workers in PMT and slightly less than half of workers in RSS. In general, close to half of all females worked in GOC and RSS, while nearly three quarters of all males worked in MCT and PMT, as shown in Exhibit 2.27.

Exhibit 2.26: 1996 Distribution of Gender by Occupation Type

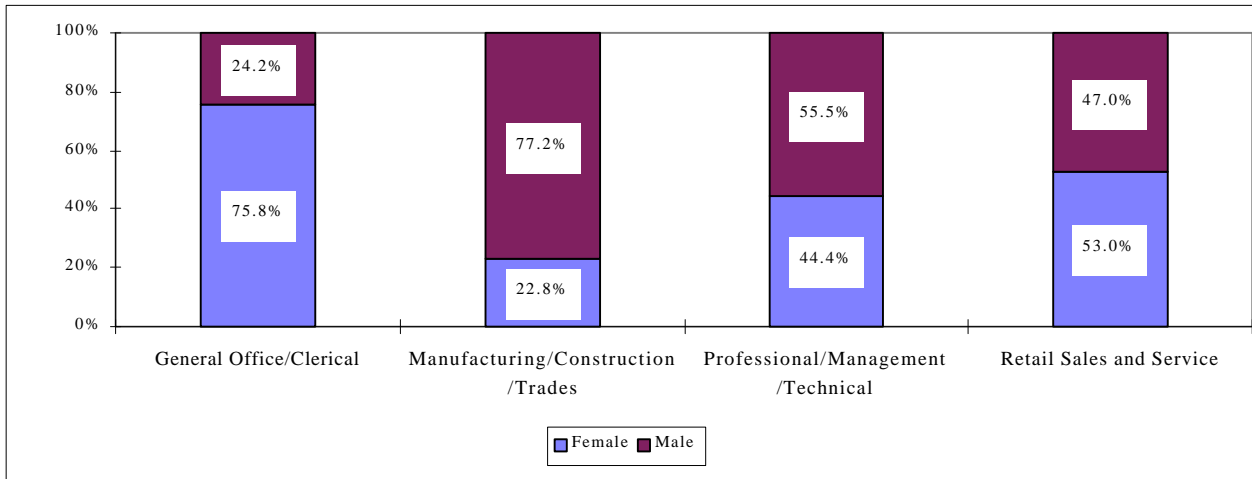


Exhibit 2.27: 1996 Distribution of Workers' Occupation Type by Gender

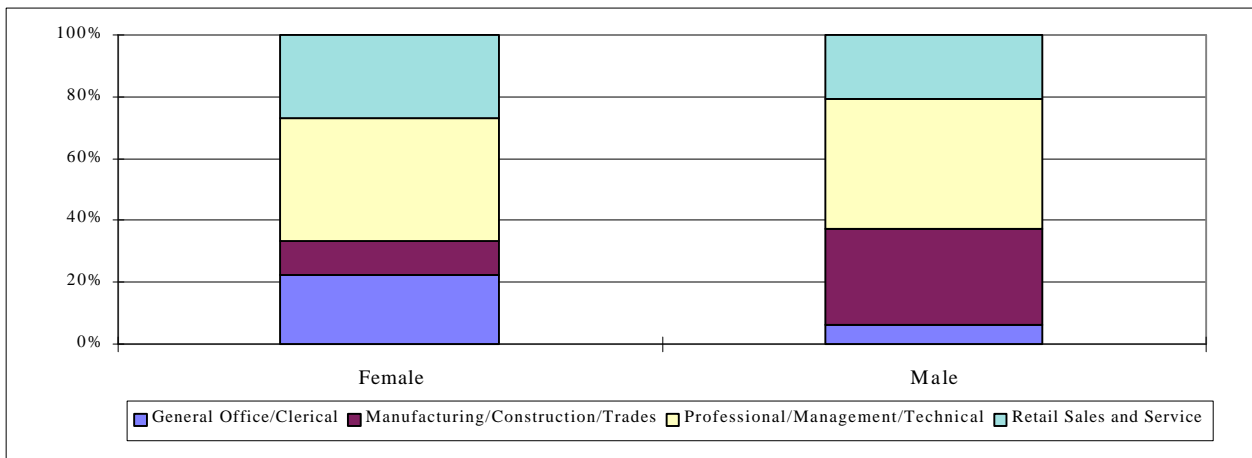


Exhibit 2.28 shows no significant differences between workers of various occupations in terms of distribution of the residential location. In each occupation type, about 45% of the workers lived in Toronto. However, Exhibit 2.29 shows that nearly 60% of GOC workers, 60% of PMT workers and slightly more than 50% of RSS workers had their employment locations in Toronto, with a relatively large share of these locations in PD 1. In contrast, nearly 60% of MCT workers had their employment locations outside Toronto, with half of these locations in York and Peel.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 2.28: 1996 Distribution of Residential Location by Occupation Type

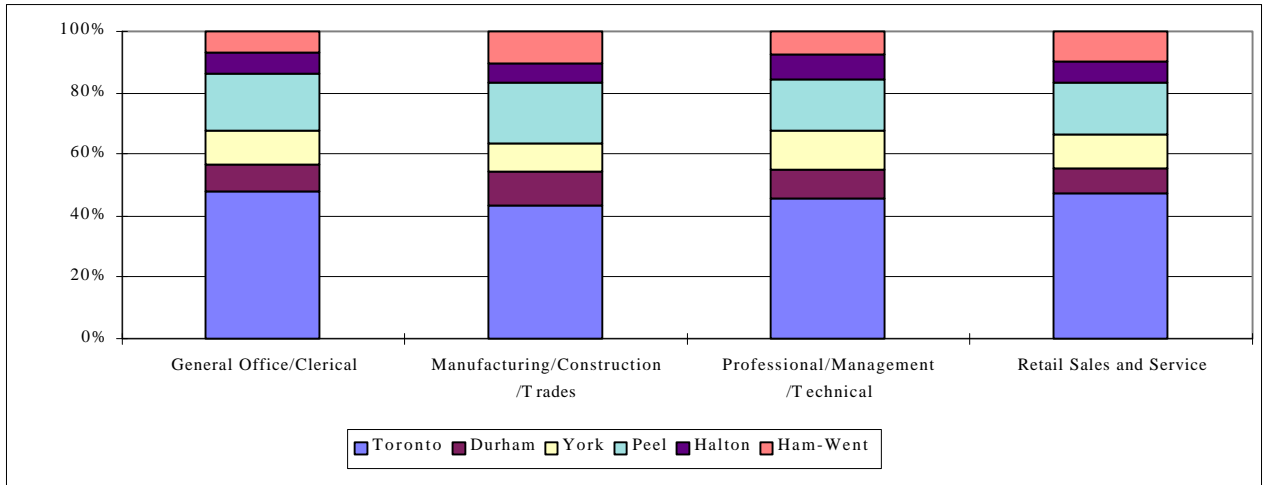
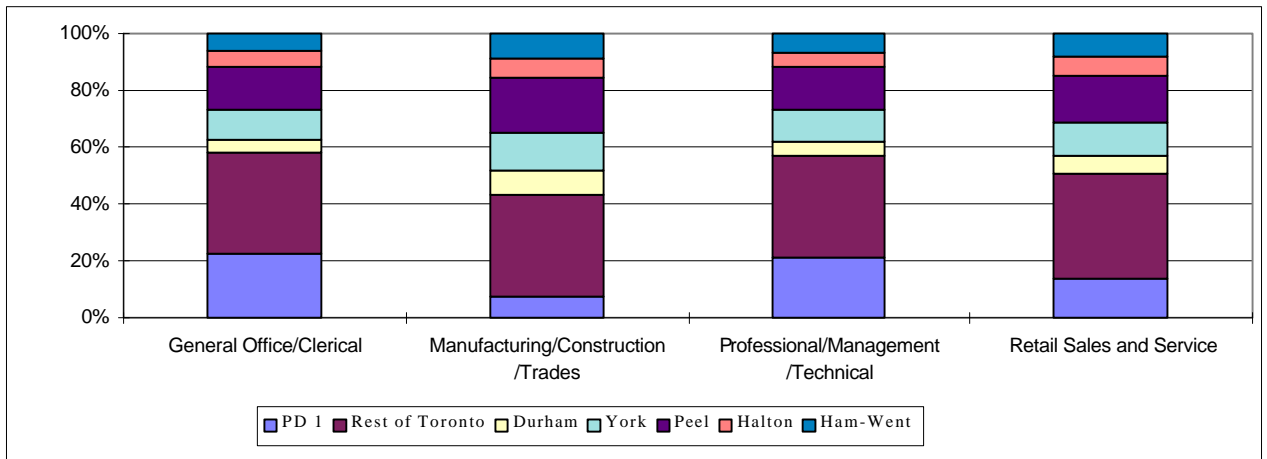


Exhibit 2.29: 1996 Distribution of Employment Location by Occupation Type



2.3 SUMMARY OF TRENDS AND PERSON TRAVEL DEMAND IMPLICATIONS

2.3.1 Trends

The most notable changes observed in the above socio-economic characteristics are summarised in Exhibit 2.30.

2.3.2 Implications

Some travel demand implications based on the above socio-economic trends include:

- fewer car-pooling opportunities during peak periods in relation to the reduced proportion of households with multiple workers (e.g. households of two adults only, both working), particularly in Toronto;

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 2.30: Summary of Socio-Economic Characteristics (1986-1996)

	1986	1991	1996	Change ¹			Comments
				1986-91	1991-96	1986-96	
Household Composition							
Percent of 0-worker households	16.0%	19.9%	22.8%	3.8%	3.0%	6.8%	mainly occupied by single or two adults only
Percent of households with at least 2 workers	51.0%	48.3%	46.1%	-2.7%	-2.2%	-4.9%	particularly households occupied by two adults only
Number of workers per household in:							
GTA	1.53	1.44	1.34	-5.9%	-6.6%	-12.1%	
Toronto	1.48	1.34	1.22	-9.5%	-8.8%	-17.5%	
905 Belt	1.58	1.54	1.46	-2.7%	-5.2%	-7.8%	
Employed Labour Force (ELF) Characteristics							
ELF participation rate for:							
GTA residents	55.0%	52.0%	49.1%	-3.0%	-2.9%	-5.9%	
Persons aged 16-25	65.9%	58.9%	52.9%	-7.0%	-6.1%	-13.0%	
Persons aged 26-50	84.7%	82.6%	81.3%	-2.1%	-1.3%	-3.4%	
Persons aged 51-65	59.2%	55.7%	51.2%	-3.5%	-4.5%	-7.9%	
Females	56.6%	55.7%	51.8%	-0.9%	-3.8%	-4.7%	
Males	73.0%	68.2%	64.9%	-4.8%	-3.4%	-8.1%	
Toronto residents	65.1%	60.5%	55.7%	-4.6%	-4.8%	-9.4%	
Other residents	64.1%	63.2%	60.4%	-0.9%	-2.8%	-3.6%	
ELF (millions)	2.24	2.38	2.42	6.3%	1.7%	8.2%	
Percent of full-time ELF	83.8%	79.6%	79.2%	-4.2%	-0.4%	-4.6%	the decline was almost entirely by male workers
Percent of ELF aged 16-30	36.5%	32.1%	27.7%	-4.4%	-4.3%	-8.7%	
Percent of ELF aged 31-50	46.5%	51.6%	57.3%	5.1%	5.7%	10.7%	
Percent of ELF aged 56-65	8.4%	7.5%	6.6%	-0.9%	-0.9%	-1.7%	
Median age of ELF	34.8	35.8	36.9	2.9%	3.1%	6.0%	
Percent of female ELF	44.7%	45.9%	46.1%	1.2%	0.2%	1.3%	
Percent of ELF residing in Toronto	54.3%	48.7%	45.9%	-5.6%	-2.8%	-8.4%	
Percent of ELF residing in York or Peel	22.8%	26.8%	29.1%	4.0%	2.3%	6.3%	
Percent of employment in PD 1	18.8%	18.2%	17.1%	-0.6%	-1.1%	-1.8%	
Percent of employment in rest of Toronto	41.3%	38.3%	36.4%	-3.0%	-1.9%	-4.9%	
Percent of employment in York or Peel	20.6%	24.4%	27.3%	3.8%	2.9%	6.7%	

¹ The change in any "Percent" or ELFPR from year 1 to year 2 is calculated as the Percent in year 2 minus that in year 1. Otherwise (e.g. ELF), the change is calculated as the percentage change, that is, the number in year 2 minus the number in year 1 divided by the number in year 1.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

- reduced proportion of work trips, most of which are typically made during the peak periods, due to the reduction in ELFPR. This is likely to be more pronounced for persons aged 16-25, males or residents of Toronto;
- increased proportion of discretionary travel and off-peak travel due to the increased proportion of part-time workers;
- reduced transit mode split for the work trip due to the reduced proportion of workers aged 16 to 30 who are more prone to use transit for the work commute than workers in other age groups;
- increased auto-driver mode split for the work trip due to the increased proportion of workers aged 31 to 50 who are more prone to drive to and from work than workers in other age groups;
- reduction in transit mode split for the work trip might be mitigated by the increased proportion of females in the workforce, who are generally more prone to use transit;
- reduced transit mode split for the work trip due to the reduced proportion of workers from Toronto, which has a relatively intensive transit system compared to the other regions; and
- reduced transit mode split in relation to the reduced proportion of employment in Toronto, including PD 1, and the corresponding increase in the proportion of employment in the 905 Belt, particularly in York and Peel.

3. URBAN ACTIVITY SYSTEM CHARACTERISTICS

Travel demand is a function of the urban activity system and the distribution of activities within that system. This chapter presents an examination of changes in land use densities and spatial interaction between residential and employment locations in the GTA.

3.1 LAND USE DENSITY

One objective of modern transportation planning is to encourage higher densities of mixed land use for (i) fewer and shorter trips and (ii) effective transit development and use. This section examines changes in population and employment densities in the two five-year periods between 1986 and 1996. Land use density is measured as the activity size (e.g. population or number or jobs) in a spatial unit divided by the area of that spatial unit. Estimating densities using spatial units large in area could be misleading, if the activity is not spread homogeneously over space. For example, consider two regions with the same area and population, but the population of one region is uniformly distributed over space while the population of the other region is concentrated in a few zones. The population density of the two regions based on the population size divided by the region area would yield equal values for the densities of the two regions. A better estimate would be based on the average density of the zones comprising the region. Therefore, in this study, land use density is estimated at the traffic zone level and the changes are examined in terms of the average and distribution of zonal density.

3.1.1 Population Density

Exhibits 3.1-3.3 display zonal population densities in 1986, 1991 and 1996, respectively. The plots show that the number of low-density zones (i.e. less than 1,000 residents per square kilometre) dropped from 672 in 1986 to 576 in 1996. During the same period, the number of zones with higher population densities increased. However, the increase in the number of lower-medium density zones (i.e. 1,000 to 4,000 residents per square kilometre) was more pronounced than the increase in the number of zones with higher densities.

Exhibit 3.1: 1986 Population Density

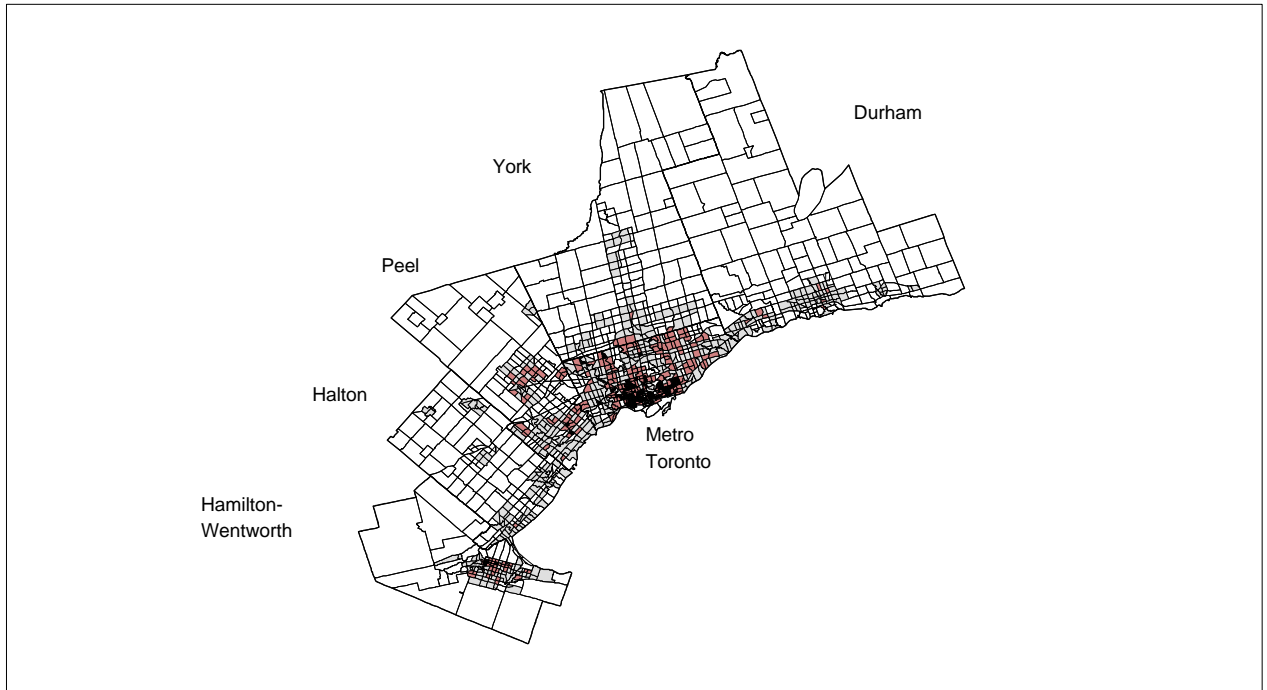


Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 3.2: 1991 Population Density



Exhibit 3.3: 1996 Population Density

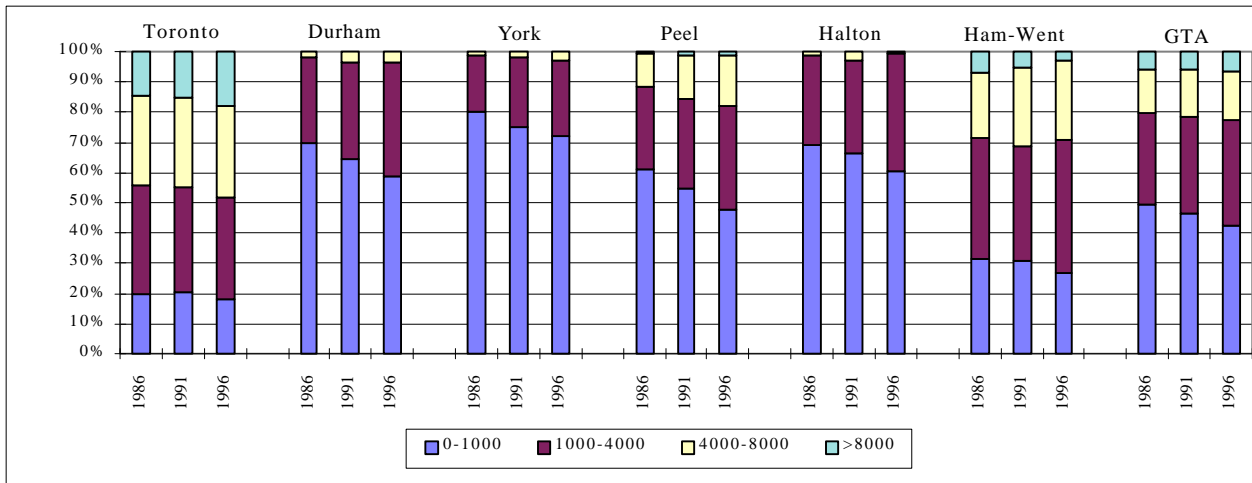


Looking at the six regions, Exhibit 3.4 shows that Toronto's local share of high-density zones (i.e. greater than 8,000 residents per square kilometre) increased while the share of zones with lower densities dropped. In Hamilton-Wentworth, the shares of low- and high-density zones dropped while the shares of medium-density zones increased. In Peel, both categories of medium density zones increased in share. Peel's low-

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

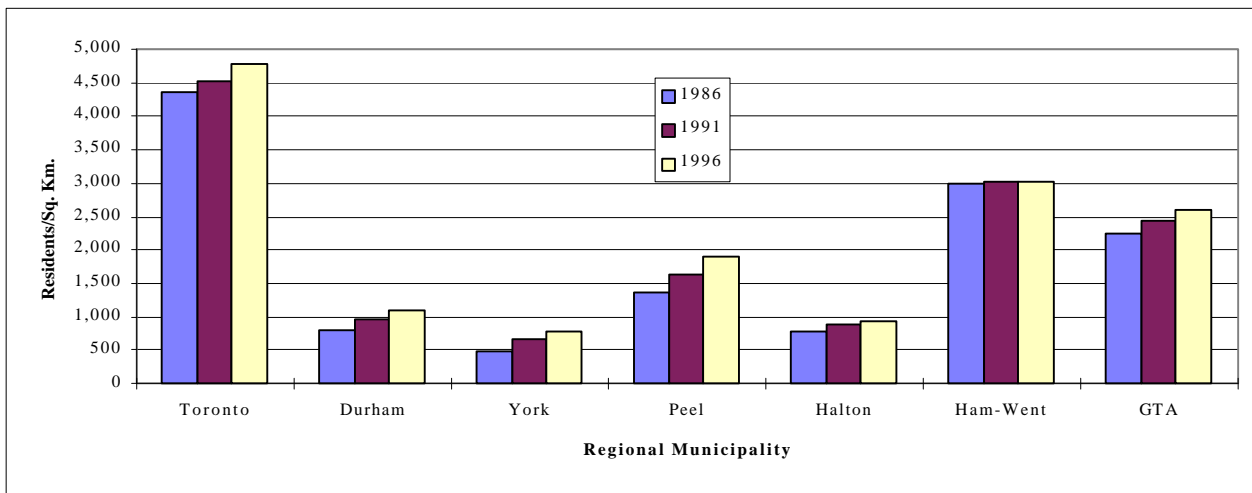
density zones, though reduced in number, still constituted slightly less than half the zones in Peel in 1996. Durham, York and Halton, with most of their zones in the low and lower-medium categories, saw a reduction in the low density zones and an increase in the lower-medium density zones.

Exhibit 3.4: DISTRIBUTION OF ZONAL POPULATION DENSITY (RESIDENTS/SQ. KM.)



On average, the zonal density in all regions, with the exception of Hamilton-Wentworth, increased in the two five-year periods, as shown in Exhibit 3.5. However, the zonal population density outside Toronto remained much lower than its Toronto counterpart.

Exhibit 3.5: AVERAGE ZONAL POPULATION DENSITY (RESIDENTS/SQ. KM.)



3.1.2 Employment Density

As mentioned earlier, information on the usual place of work were not collected in the 1986 TTS survey, and the 1986 census data might yield misleading results if examined at the zonal level in conjunction with the corresponding information from the 1991 and 1996 TTS surveys. In addition, the 1991 and 1996 census information were not available at the time of this study. Therefore, this section focuses on changes which occurred between 1991 and 1996 only, based on the TTS information.

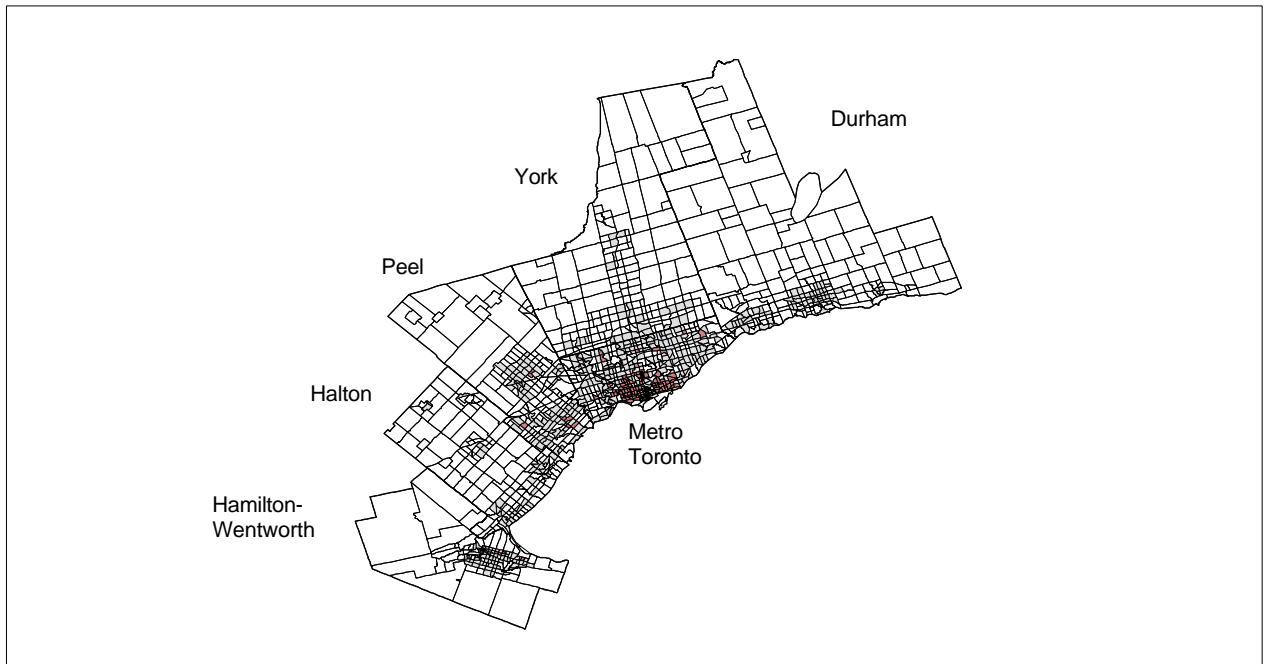
Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibits 3.6-3.7 display zonal employment densities in 1991 and 1996, respectively.

Exhibit 3.6: 1991 Employment Density



Exhibit 3.7: 1996 Employment Density



The exhibits show that the number of low-density zones (i.e. less than 1,000 residents per square kilometre) dropped by 55, from 805 in 1991 to 750 in 1996. During the same period, the number of low-medium

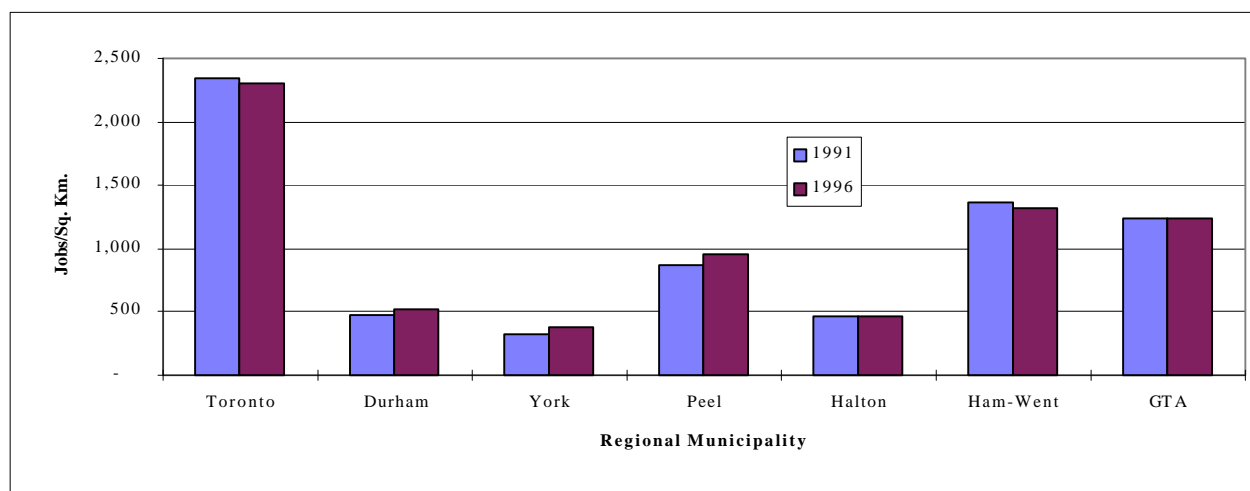
Exploring Person Travel Trends in the Greater Toronto Area

Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

density zones increased by 53 zones, while the number of high-medium and high density zones changed insignificantly. This finding is not surprising since the number of jobs in Toronto, including PD 1, and Hamilton-Wentworth dropped between 1991 and 1996, while the number of jobs in the other regions, which typically have lower densities, increased.

Exhibit 3.8 shows that the average employment density in Toronto and Hamilton Wentworth declined while average employment density in the other regions increased. Overall, the average employment density in the GTA increased very slightly. However, the employment density outside Toronto is still far lower than its Toronto counterpart. The trends in population and employment densities observed here indicate increased urban sprawl outside Toronto.

Exhibit 3.8: Average Zonal Employment Density (Jobs/Sq. Km.)

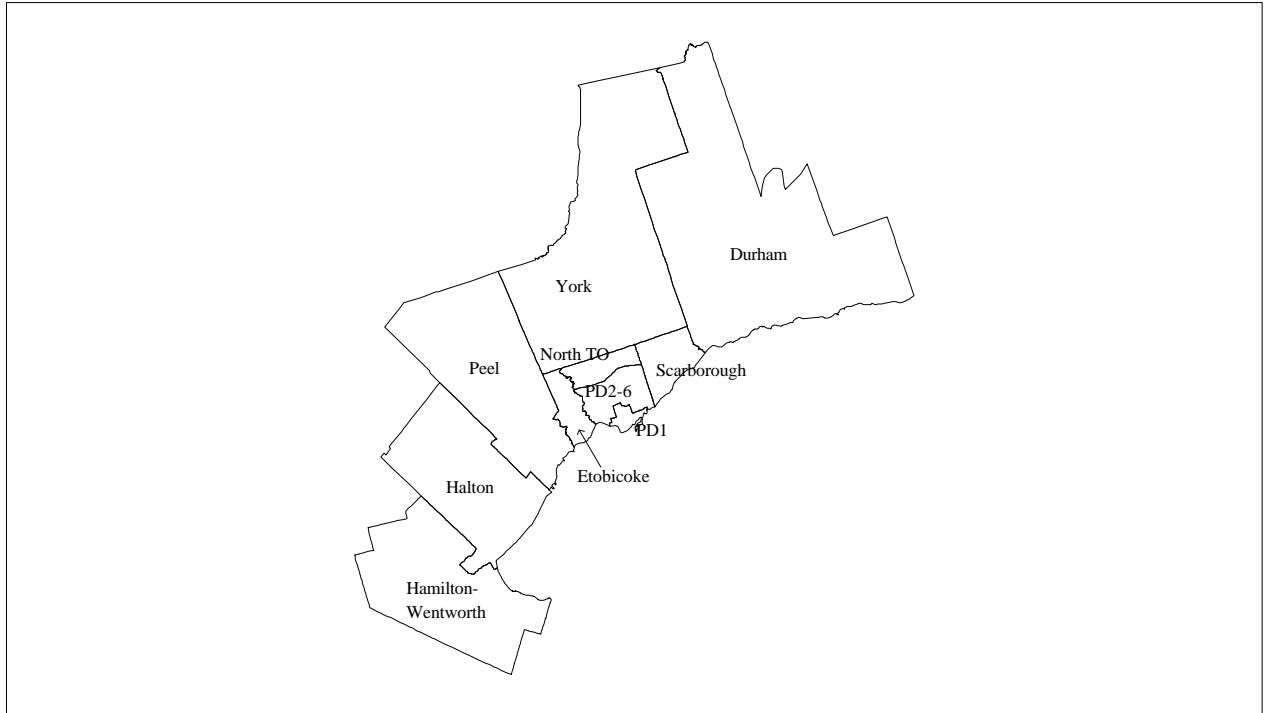


3.2 SPATIAL INTERACTION

Thus far, this study examined changes in size and density of the population, employed labour force and employment across the region. This section focuses on the interaction between the home-end and the employment-end of the employed labour force. It deals primarily with the joint distribution of the residential and employment locations of the employed labour force, more commonly referred to as Place of Residence - Place of Work (POR-POW) Linkages. This joint distribution is analogous to the Origin-Destination trip matrix.

Due to the importance of Toronto as a major regional centre of population and employment in the GTA (about 50% of the GTA population and 50% of the GTA employment are located in Toronto), it was decided to divide Toronto into 5 sub-regions for the spatial interaction analysis. These divisions are shown in Exhibit 3.9.

Exhibit 3.9: The GTA Regions



Exhibits 3.10-3.12 show the POR-POW linkages in 1986, 1991 and 1996, respectively. The highlighted cells represent the largest ten linkages in the GTA. The marginal distributions of the ELF residential location and employment location were discussed earlier in sections 2.2.2 and 2.2.3, respectively. Exhibit 3.10 shows that Planning Districts 2 to 6 (PD 2-6), which represents the group of districts surrounding PD 1, had the GTA largest population and the GTA second largest employment market, next to PD 1, in 1986. However, as mentioned earlier, the employed labour force and employment in Toronto and Hamilton-Wentworth decreased while the employed labour force and employment in the other four regions increased between 1986 and 1996. In 1996, Peel had more employment than PD 2-6 while its employed labour force increased to a level slightly less than the employment labour force residing in PD 2-6. Etobicoke experienced similar changes to PD 2-6 but in a smaller magnitude. North Toronto and Scarborough, each experienced growth in employed labour force and employment between 1986 and 1991, but declined again in the next five years.

The next three sections discuss the magnitude of and changes in the spatial interactions between the GTA regions.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 3.10: 1986 Place of Residence-Place of Work Linkages

Number of Workers GTA %	Employment Location:											
	Residential Location:											
	PD 1	PD 2-6	Etobicoke	North TO	Scarboro.	Toronto	Durham	York	Peel	Halton	Ham-Went	GTA Total
PD 1	48,631 2.2%	12,810 0.6%	2,764 0.1%	2,881 0.1%	2,707 0.1%	69,793 3.2%	271 0.0%	1,311 0.1%	2,151 0.1%	217 0.0%	86 0.0%	73,829 3.4%
PD 2-6	174,048 7.9%	179,839 8.2%	28,884 1.3%	39,108 1.8%	27,101 1.2%	448,980 20.4%	2,206 0.1%	18,653 0.8%	21,115 1.0%	1,453 0.1%	619 0.0%	493,026 22.4%
Etobicoke	29,184 1.3%	24,704 1.1%	65,637 3.0%	13,514 0.6%	2,164 0.1%	135,203 6.1%	351 0.0%	5,266 0.2%	24,023 1.1%	1,480 0.1%	314 0.0%	166,637 7.6%
North Toronto	33,791 1.5%	41,473 1.9%	12,129 0.6%	65,564 3.0%	10,504 0.5%	163,461 7.4%	1,061 0.0%	18,917 0.9%	8,894 0.4%	459 0.0%	162 0.0%	192,954 8.8%
Scarborough	53,636 2.4%	48,229 2.2%	6,060 0.3%	20,254 0.9%	103,628 4.7%	231,807 10.5%	4,598 0.2%	17,033 0.8%	5,497 0.2%	481 0.0%	101 0.0%	259,517 11.8%
<i>Toronto Total</i>	339,290 15.4%	307,055 14.0%	115,474 5.2%	141,321 6.4%	146,104 6.6%	1,049,244 47.7%	8,487 0.4%	61,180 2.8%	61,680 2.8%	4,090 0.2%	1,282 0.1%	1,185,963 53.9%
Durham	11,306 0.5%	7,919 0.4%	1,149 0.1%	4,611 0.2%	16,987 0.8%	41,972 1.9%	115,024 5.2%	5,928 0.3%	1,404 0.1%	103 0.0%	11 0.0%	164,442 7.5%
York	19,649 0.9%	21,425 1.0%	7,289 0.3%	26,079 1.2%	12,944 0.6%	87,386 4.0%	1,846 0.1%	87,371 4.0%	7,287 0.3%	277 0.0%	180 0.0%	184,347 8.4%
Peel	31,490 1.4%	20,993 1.0%	48,274 2.2%	12,806 0.6%	2,730 0.1%	116,293 5.3%	599 0.0%	7,139 0.3%	193,671 8.8%	7,216 0.3%	1,138 0.1%	326,056 14.8%
Halton	10,789 0.5%	3,469 0.2%	6,098 0.3%	1,851 0.1%	793 0.0%	23,000 1.0%	183 0.0%	819 0.0%	23,642 1.1%	83,160 3.8%	12,750 0.6%	143,554 6.5%
Hamilton-Wentworth	1,835 0.1%	804 0.0%	1,007 0.0%	482 0.0%	240 0.0%	4,368 0.2%	247 0.0%	337 0.0%	3,100 0.1%	18,746 0.9%	169,045 7.7%	195,843 8.9%
GTA Total	414,359 18.8%	361,665 16.4%	179,291 8.1%	187,150 8.5%	179,798 8.2%	1,322,263 60.1%	126,386 5.7%	162,774 7.4%	290,784 13.2%	113,592 5.2%	184,406 8.4%	2,200,205 100.0%

Source: Statistics Canada, Census of 1986

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 3.11: 1991 Place of Residence-Place of Work Linkages

Number of Workers GTA %	Employment Location:											
	Residential Location:	PD 1	PD 2-6	Etobicoke	North TO	Scarboro.	Toronto	Durham	York	Peel	Halton	Ham-Went
PD 1	51,108 2.2%	12,548 0.5%	2,167 0.1%	3,942 0.2%	1,651 0.1%	71,416 3.1%	208 0.0%	1,930 0.1%	2,293 0.1%	88 0.0%	0 0.0%	75,935 3.3%
PD 2-6	168,284 7.4%	166,732 7.3%	23,466 1.0%	41,157 1.8%	26,935 1.2%	426,574 18.7%	3,481 0.2%	19,651 0.9%	22,844 1.0%	1,595 0.1%	724 0.0%	474,869 20.8%
Etobicoke	26,185 1.1%	16,204 0.7%	54,286 2.4%	11,758 0.5%	2,811 0.1%	111,244 4.9%	862 0.0%	6,157 0.3%	26,503 1.2%	2,097 0.1%	748 0.0%	147,611 6.5%
North Toronto	25,476 1.1%	25,311 1.1%	8,696 0.4%	58,857 2.6%	11,585 0.5%	129,925 5.7%	1,676 0.1%	22,392 1.0%	8,308 0.4%	393 0.0%	25 0.0%	162,719 7.1%
Scarborough	52,498 2.3%	39,585 1.7%	4,972 0.2%	24,628 1.1%	101,981 4.5%	223,664 9.8%	4,227 0.2%	21,801 1.0%	7,523 0.3%	555 0.0%	0 0.0%	257,770 11.3%
<i>Toronto Total</i>	<i>323,551</i> <i>14.1%</i>	<i>260,380</i> <i>11.4%</i>	<i>93,587</i> <i>4.1%</i>	<i>140,342</i> <i>6.1%</i>	<i>144,963</i> <i>6.3%</i>	<i>962,823</i> <i>42.1%</i>	<i>10,454</i> <i>0.5%</i>	<i>71,931</i> <i>3.1%</i>	<i>67,471</i> <i>3.0%</i>	<i>4,728</i> <i>0.2%</i>	<i>1,497</i> <i>0.1%</i>	<i>1,118,904</i> <i>48.9%</i>
Durham	15,871 0.7%	13,057 0.6%	1,706 0.1%	6,243 0.3%	22,408 1.0%	59,285 2.6%	124,506 5.4%	11,636 0.5%	2,246 0.1%	251 0.0%	28 0.0%	197,952 8.7%
York	25,005 1.1%	24,287 1.1%	7,801 0.3%	31,760 1.4%	20,072 0.9%	108,925 4.8%	3,852 0.2%	119,493 5.2%	9,971 0.4%	445 0.0%	410 0.0%	243,096 10.6%
Peel	33,123 1.4%	24,718 1.1%	44,482 1.9%	16,290 0.7%	3,995 0.2%	122,608 5.4%	771 0.0%	11,599 0.5%	225,756 9.9%	7,953 0.3%	1,629 0.1%	370,316 16.2%
Halton	15,129 0.7%	3,855 0.2%	6,960 0.3%	3,830 0.2%	583 0.0%	30,357 1.3%	22 0.0%	1,785 0.1%	29,524 1.3%	84,173 3.7%	10,466 0.5%	156,327 6.8%
Hamilton-Wentworth	3,258 0.1%	1,057 0.0%	1,951 0.1%	581 0.0%	349 0.0%	7,196 0.3%	25 0.0%	1,409 0.1%	5,839 0.3%	22,500 1.0%	163,348 7.1%	200,317 8.8%
GTA Total	415,937 18.2%	327,354 14.3%	156,487 6.8%	199,046 8.7%	192,370 8.4%	1,291,194 56.5%	139,630 6.1%	217,853 9.5%	340,807 14.9%	120,050 5.2%	177,378 7.8%	2,286,912 100.0%

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 3.12: 1996 Place of Residence-Place of Work Linkages

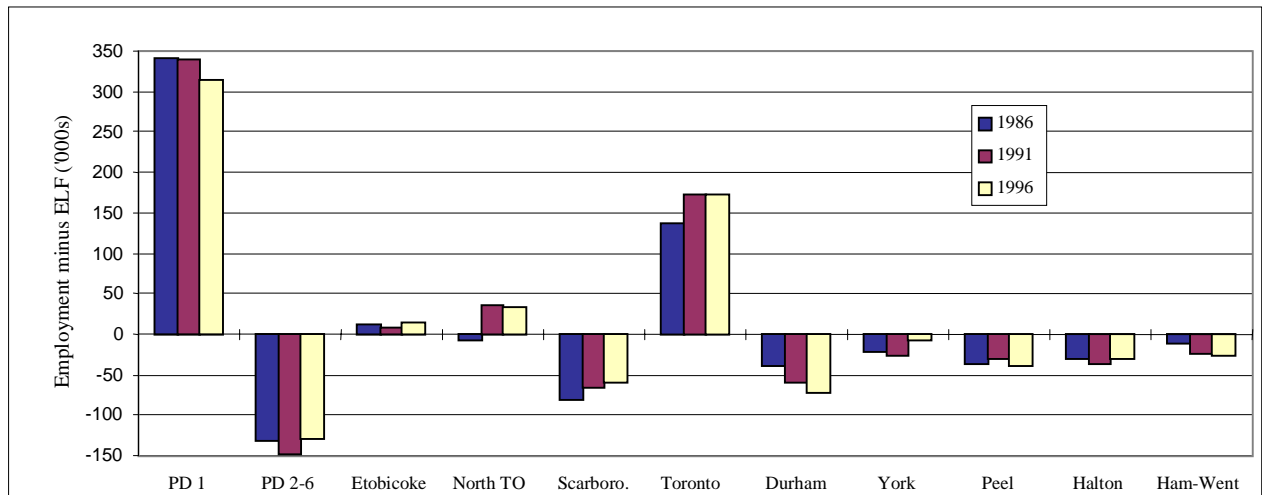
Number of Workers GTA %	Employment Location:											
	Residential Location:	PD 1	PD 2-6	Etobicoke	North TO	Scarboro.	Toronto	Durham	York	Peel	Halton	Ham-Went
PD 1	53,223 2.3%	11,857 0.5%	2,136 0.1%	4,347 0.2%	2,554 0.1%	74,117 3.2%	237 0.0%	2,201 0.1%	3,295 0.1%	375 0.0%	152 0.0%	80,377 3.5%
PD 2-6	145,078 6.3%	162,381 7.0%	22,143 1.0%	39,059 1.7%	24,966 1.1%	393,627 17.0%	2,240 0.1%	27,597 1.2%	23,471 1.0%	1,507 0.1%	402 0.0%	448,844 19.4%
Etobicoke	22,608 1.0%	18,029 0.8%	49,498 2.1%	12,327 0.5%	1,999 0.1%	104,461 4.5%	333 0.0%	9,003 0.4%	23,897 1.0%	1,495 0.1%	187 0.0%	139,376 6.0%
North Toronto	24,193 1.0%	26,287 1.1%	8,855 0.4%	53,380 2.3%	9,063 0.4%	121,778 5.3%	1,123 0.0%	24,856 1.1%	9,757 0.4%	557 0.0%	126 0.0%	158,197 6.8%
Scarborough	44,606 1.9%	38,386 1.7%	4,638 0.2%	20,957 0.9%	89,506 3.9%	198,093 8.6%	4,567 0.2%	26,312 1.1%	7,464 0.3%	473 0.0%	38 0.0%	236,947 10.3%
Toronto Total	289,708 12.5%	256,940 11.1%	87,270 3.8%	130,070 5.6%	128,088 5.5%	892,076 38.6%	8,500 0.4%	89,969 3.9%	67,884 2.9%	4,407 0.2%	905 0.0%	1,063,741 46.0%
Durham	17,726 0.8%	12,059 0.5%	2,262 0.1%	8,115 0.4%	24,553 1.1%	64,715 2.8%	129,290 5.6%	15,129 0.7%	3,772 0.2%	347 0.0%	62 0.0%	213,315 9.2%
York	29,573 1.3%	23,835 1.0%	8,557 0.4%	32,491 1.4%	19,895 0.9%	114,351 4.9%	2,542 0.1%	138,104 6.0%	12,382 0.5%	594 0.0%	202 0.0%	268,175 11.6%
Peel	39,123 1.7%	21,401 0.9%	46,985 2.0%	16,893 0.7%	4,176 0.2%	128,578 5.6%	638 0.0%	15,698 0.7%	248,621 10.8%	13,452 0.6%	1,470 0.1%	408,457 17.7%
Halton	15,470 0.7%	3,690 0.2%	6,533 0.3%	2,786 0.1%	1,098 0.0%	29,577 1.3%	160 0.0%	1,822 0.1%	31,962 1.4%	89,049 3.9%	9,895 0.4%	162,465 7.0%
Hamilton-Wentworth	2,940 0.1%	1,020 0.0%	1,480 0.1%	814 0.0%	192 0.0%	6,446 0.3%	209 0.0%	386 0.0%	5,815 0.3%	25,038 1.1%	156,396 6.8%	194,290 8.4%
GTA Total	394,540 17.1%	318,945 13.8%	153,087 6.6%	191,169 8.3%	178,002 7.7%	1,235,743 53.5%	141,339 6.1%	261,108 11.3%	370,436 16.0%	132,887 5.8%	168,930 7.3%	2,310,443 100.0%

3.2.1 Employment - Employed Labour Force Balance

This section examines the difference between the employment located in each region and the employed labour force residing in the same region in 1986, 1991 and 1996. This provides an indication of the magnitude of and changes in the regional jobs-housing balance in the GTA. It should be noted that a difference of zero between employment and employed labour force in a region does not necessarily mean that all workers residing in the region work in the same region. It simply indicates that neither housing is more dominant than jobs nor jobs are more dominant than housing in that region. Therefore, this measure reflects the relative dominance of jobs and housing in a region.

As shown in Exhibit 3.13, in general, Toronto has the largest imbalance in terms of the difference between employment and employed labour force, where the former exceeds the latter by about 150,000. In other words, there are about 150,000 workers working in Toronto more than the resident employed labour force.

Exhibit 3.13: Regional Employment-Employed Labour Force (ELF) Balance



Within Toronto, PD 1 has about 300,000 jobs more than its resident employed labour force, which reflects the special role that PD 1 plays as the largest employment centre in the GTA. As the exhibit shows, this number declined by nearly 26,000 between 1991 and 1996. PD 2-6, and to a lesser degree Scarborough, show an opposite pattern to that of PD 1, that is, the employed labour force resident in each region exceeds in number the jobs in the same region. This reflects the greater popularity of these regions as a place of residence than a place of work. The imbalance between the employment and employed labour force in these two regions declined slightly between 1991 and 1996. Each of Etobicoke and North Toronto has more jobs than the resident employed labour force. However, the difference is quite small.

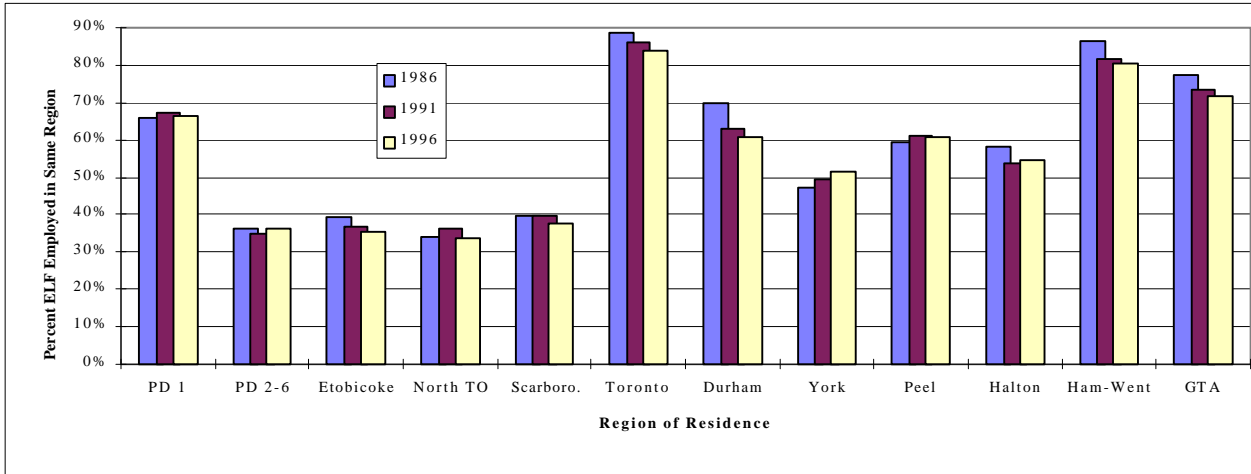
Outside Toronto, the general pattern is such that the employed labour force resident in each region is larger than the number of jobs in the same region. With the exception of Durham, the difference between the two values is fairly small.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

3.2.2 Self Containment

This section examines the magnitudes of and changes in regional self-containment, measured as the proportion of the employed labour force in a region who work in the same region. Exhibit 3.14 shows these proportions for all regions in the years 1986, 1991 and 1996.

Exhibit 3.14: Regional Self-Containment of Employed Labour Force



In general, Toronto and Hamilton-Wentworth have the highest levels of self-containment in the GTA (more than 80% of the employed labour force resident in each region also work in the same region). However, these levels have declined steadily between 1986 and 1996. Within Toronto, PD 1 has the highest level of self-containment, at more than 65%, while the other four regions within Toronto have much lower self-containment levels, between 35% and 40%. Slight changes in these levels occurred in the past ten years. The high level of self-containment in Toronto with the much lower self-containment levels in individual internal regions indicate that there is significant interaction between these five sub-regions of Toronto, particularly from all sub-regions to PD 1.

Outside Toronto and Hamilton-Wentworth, York has the lowest level of self-containment. About 50% of the employed labour force resident in York work elsewhere. However, self-containment in York had improved between 1986 and 1996. The level of self-containment in Durham declined substantially, from 70% in 1986 to 61% in 1996. During the same period, Peel’s self-containment improved slightly to 61% in 1996. Halton’s self-containment declined between 1986 and 1991, but improved slightly in the next five years to reach a level of 55%.

Overall, the proportion of the GTA ELF who reside and work in the same region (considering Toronto as one region only) declined from 77% in 1986 to 72% in 1996, as shown in the above exhibit.

3.2.3 Spatial Markets

In this section, the POR-POW linkages are grouped into a set of five spatial markets: (i) workers employed in PD 1 (PD 1 employment market), (ii) workers residing and working in Toronto (Toronto - Internal), (iii) workers residing and working in Durham, York, Peel, Halton, or Hamilton-Wentworth (905 - Internal), (iv) workers residing in the 905 Belt and working in Toronto (905-Belt--> Toronto), and (v) workers residing in Toronto and working in the 905 Belt (Toronto--> 905-Belt). The spatial markets (ii)-(iv) are mutually

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

exclusive and they comprise all linkages in the GTA. However, the PD 1 employment market is dealt with separately due to its importance. It is clear that this market overlaps with the Toronto-Internal and the 905-Belt--> Toronto markets. The size and distribution of all five markets are shown in Exhibits 3.15 and 3.16, respectively.

Exhibit 3.15: Employed Labour Force in Spatial Markets

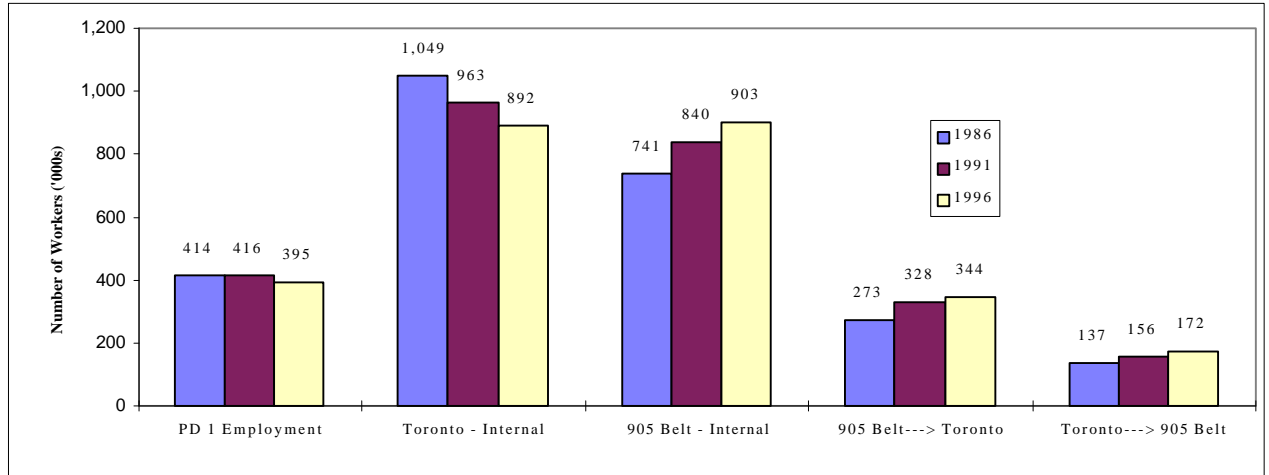
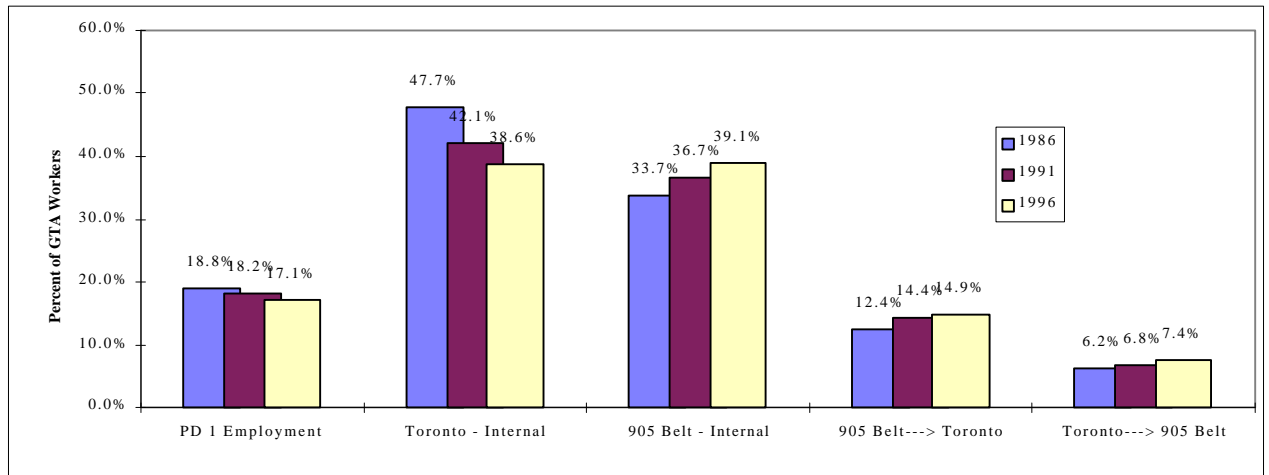


Exhibit 3.16: Distribution of ELF Spatial Markets



The PD 1 employment market size remained almost constant between 1986 and 1991 but declined by 21,400 jobs in the next five years. As a result, the proportion of GTA workers employed in PD 1 declined from 18.8% in 1986 to 17.1% in 1996. In 1986, the Toronto-Internal market represented the largest market in the GTA, at a level of more than one million workers who constituted 47.7% of all GTA workers. However, this market declined quite substantially between 1986 and 1991 and between 1991 and 1996, to reach a level of 892,000 workers, that is 38.6% of all GTA workers. In contrast, the 905-Belt - Internal market grew steadily in the two five-year periods between 1986 and 1996 to reach a level of 903,000 workers (39.1% of GTA workers), which was larger than the Toronto-Internal market in 1996. The number and percent of workers residing outside Toronto but working in it also increased in the two five-year periods. While the number of workers residing and working in Toronto declined substantially between 1986 and 1996, the

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

number and percent of workers residing in Toronto but working outside increased slightly. This indicates the increase of reverse-commuting between Toronto and the 905-Belt regions.

Each of the five markets is discussed next separately. The same scale is maintained in all charts to facilitate comparisons.

As shown in Exhibit 3.17, the decline in the PD 1 employment was primarily due to the reduction of workers residing in the rest of Toronto, particularly in PD 2-6, and working in PD 1 (-18,000 between 1986 and 1991; -36,000 between 1991 and 1996). However, this reduction was offset partially by increase in the number of workers residing outside Toronto and working in PD 1. As a result of these changes, the proportion of PD 1 workers residing outside Toronto increased from 18.1% in 1986 to 26.6% in 1996, as shown in Exhibit 3.18. Most of this increase was due to an increase in the proportions of PD 1 workers residing in York or Peel, and to a lesser degree in Durham and Halton.

Exhibit 3.17: PD 1 Workers by Region of Residence

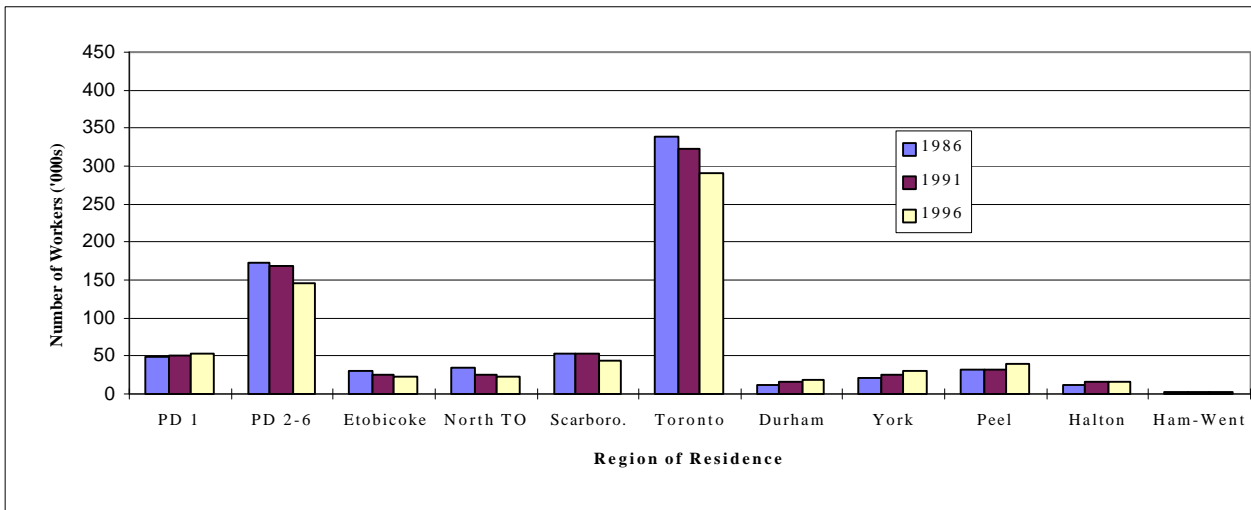
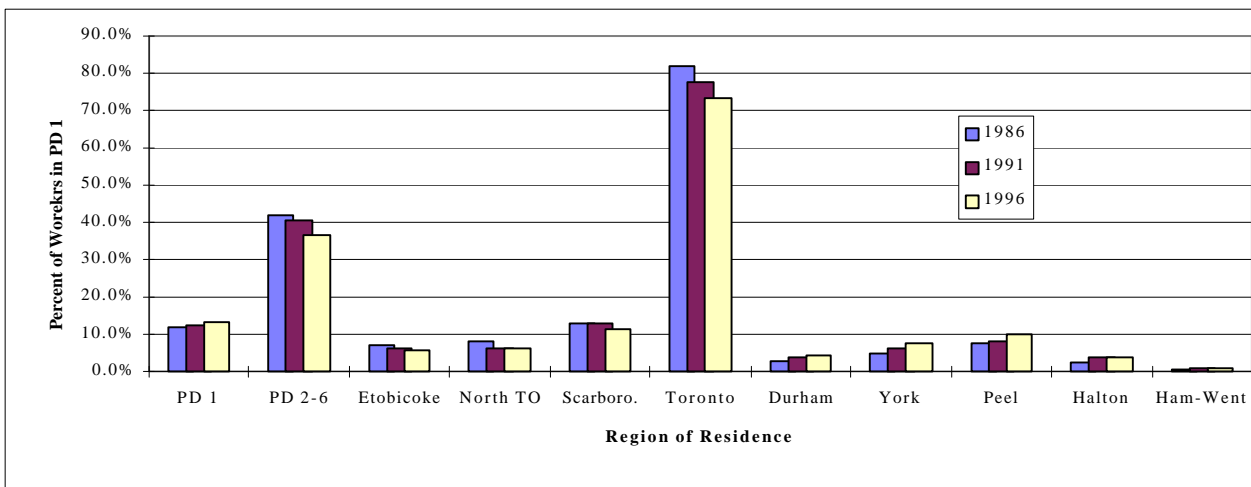


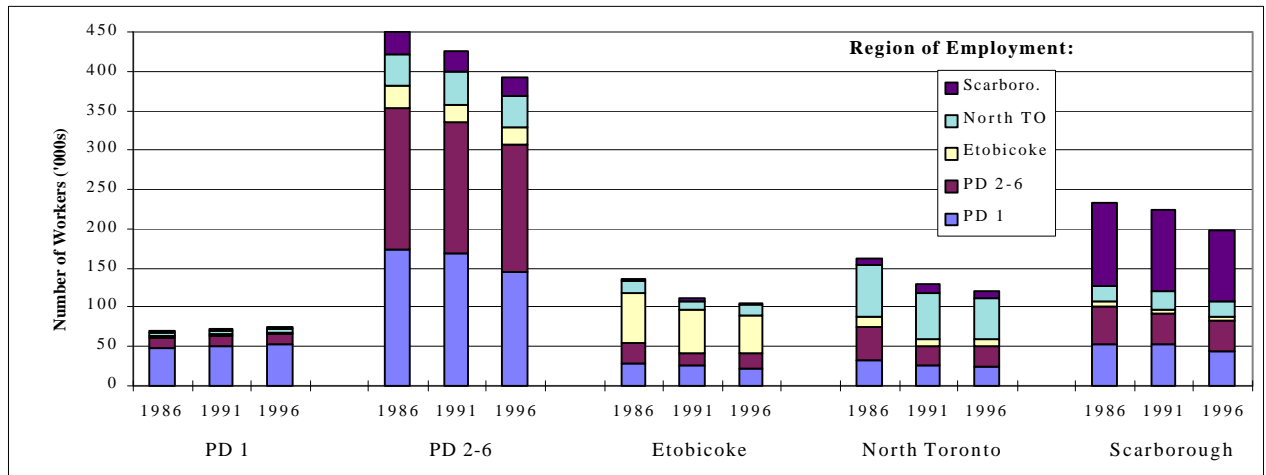
Exhibit 3.18: Distribution of Residential Location For Workers in PD 1



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

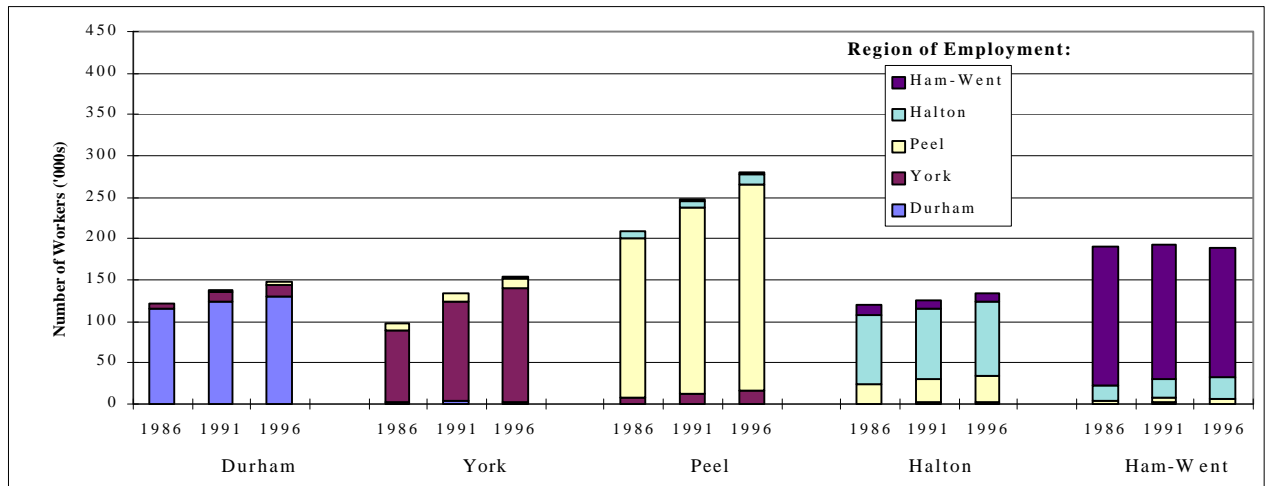
Within Toronto, the number of workers residing in each sub-region, with the exception of PD 1, declined in the two five-year periods between 1986 and 1996, as shown in Exhibit 3.19. This reduction is due to both the decline in the number of workers residing and working in the same sub-region and the decline in the number of workers residing in each sub-region but working in other locations in Toronto. As a result, no major changes occurred in the proportions of various linkages in this spatial market. Other observations from Exhibit 3.19 include the following. Workers residing in PD 1 work mainly in PD 1 and to a lesser degree in PD 2-6. In contrast, workers residing in PD 2-6 work mainly in PD 1 and PD 2-6 on almost equal footing. Workers residing in Etobicoke, North Toronto or Scarborough, work mainly in the same region, PD 1 or PD 2-6.

Exhibit 3.19: Spatial Interaction for Workers Residing and Working in Toronto



Within the 905 Belt, the number of workers residing in each region, with the exception of Hamilton-Wentworth, increased in the two five-year periods between 1986 and 1996, as shown in Exhibit 3.20. The employed labour force resident in Peel and York experienced the largest growth. Most of the workers residing in each region work in the same region, and most of the growth was due to the increase in number of these workers.

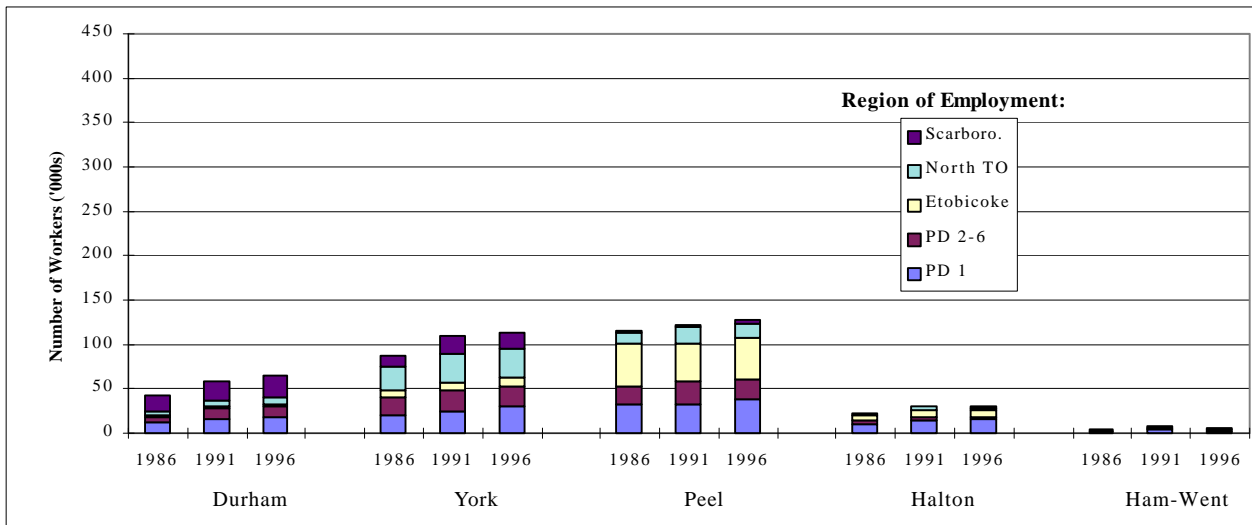
Exhibit 3.20: Spatial Interaction for Workers Residing and Working in the 905 Belt



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

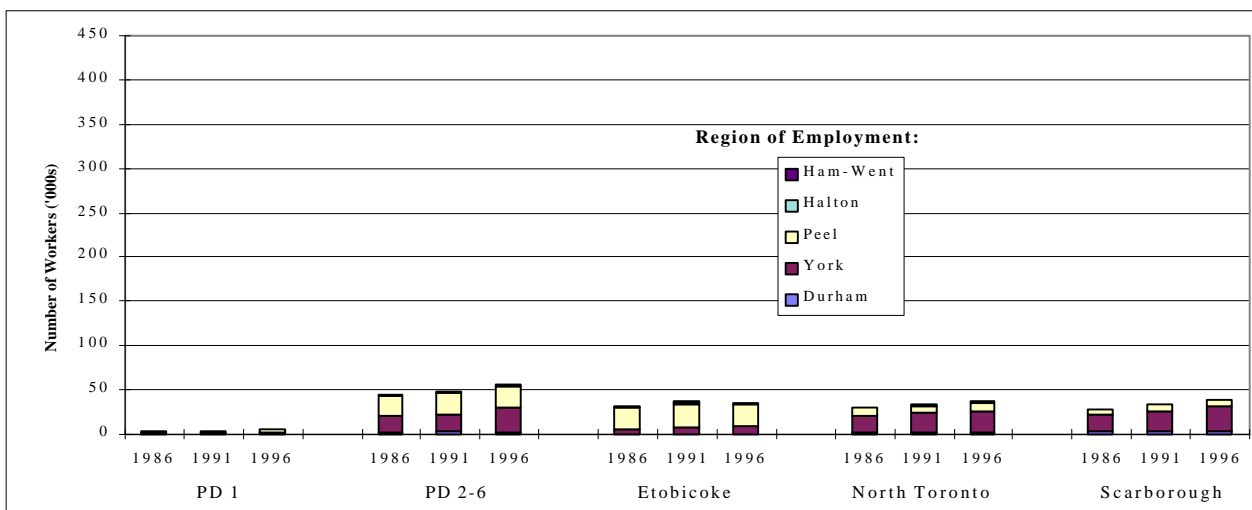
The number of Toronto workers who reside in the 905 Belt increased, particularly those residing in Peel, York and Durham who form the majority of such workers, as shown in Exhibit 3.21. The exhibit indicates that while PD 1 is a major employment location for many workers residing in the 905 Belt regions, there are more workers residing in the same regions who work in other locations in Toronto such as: Scarborough for Durham residents; North Toronto, PD 2-6 and Scarborough for York residents; Etobicoke, Pd 2-6 and North Toronto for Peel residents. The proportions of these combinations had changed only slightly between 1986 and 1996.

Exhibit 3.21: Spatial Interaction for Workers Residing in the 905 Belt and Working in Toronto



As shown in Exhibit 3.22, the number of 905-Belt workers who reside in Toronto increased, with the exception of workers residing in PD 1. The exhibit indicates that York is a popular employment location for the residents of PD 2-6, North Toronto and Scarborough who work outside Toronto. Also, Peel is a popular employment location for the residents of PD 2-6 and Etobicoke who work outside Toronto. No major changes occurred in these patterns.

Exhibit 3.22: Spatial Interaction for Workers Residing in Toronto and Working in the 905 Belt

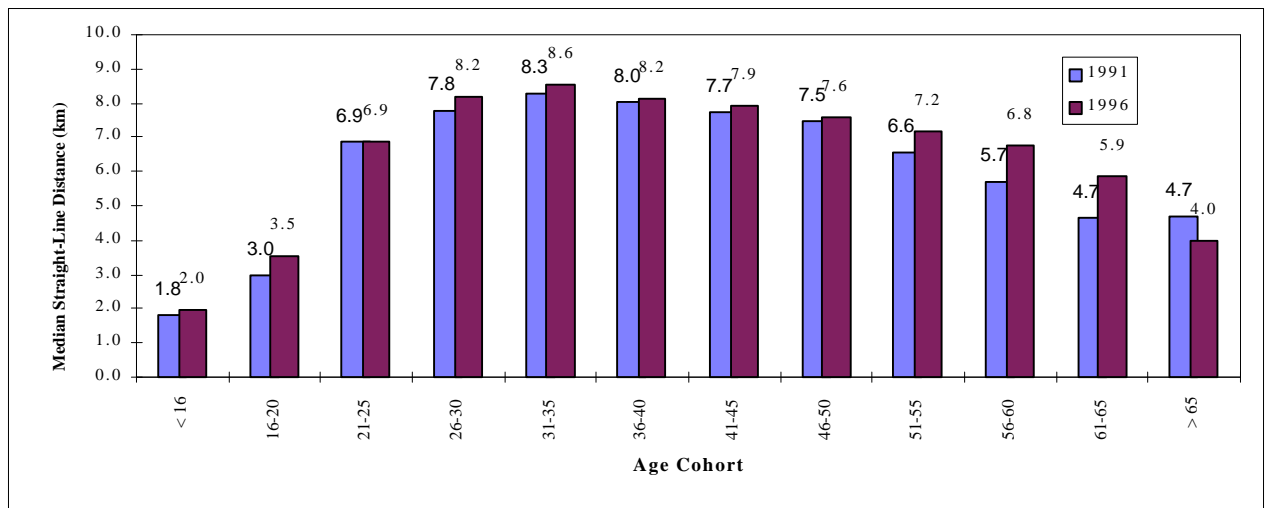


3.3 HOME-WORK DISTANCE

This section examines changes in the straight-line distance between the home-end and the work-end for the employed labour force.

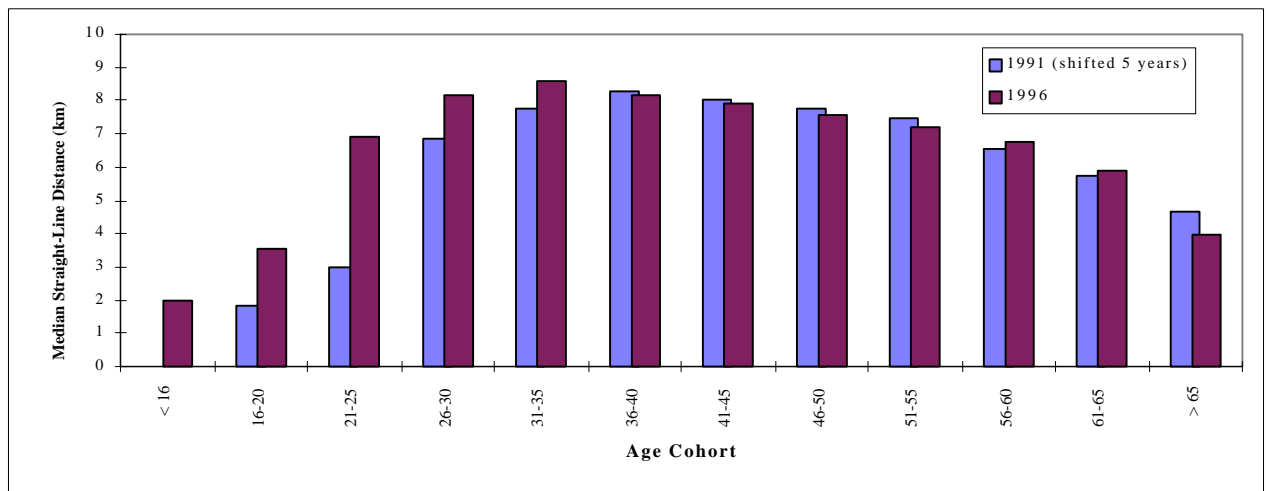
Exhibit 3.23 shows the home-work distance by age of workers. As the exhibit shows, the home-work distance increased across all age cohorts between 1991 and 1996. In general, the home-work distance increases with age until the age cohort 31-35 beyond which home-work distance declines again. As observed earlier, the population of persons aged 21-30 declined between 1991 and 1996 while the population of persons of older ages increased during the same period.

Exhibit 3.23: Median Straight-Line Distance Between Home and Work by Age



To examine further the changes in home-work distance by age of workers, the 1991 values of home-work distance were shifted by five years, as shown in Exhibit 3.24. This indicates the change in home-work distance for each age cohort as it progressed in time between 1991 and 1996.

Exhibit 3.24: Median Straight-Line Distance Between Home and Work by Shifted Age Cohorts



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

For young workers aged 16-25, the increase in home-work distance was quite substantial, as many of these workers acquired jobs for the first time. Similarly, the home-work distance for mid-age workers, that is between 26 and 35, increased fairly largely, as many of these workers had likely acquired more stable, full-time jobs, entered the family formation stage and settled in new households. Older workers, aged between 36 and 65, had slight changes in the home-work distance between 1991 and 1996. However, workers older than 65 had a much reduced home-work distance in 1996 compared to 1991. This could be due to the fact that many of such workers, living in households without children who had likely moved out, had sold their houses and moved to smaller dwelling units (e.g. apartments) in more compact areas, likely closer to their job locations.

Exhibit 3.25 show that males in general have longer home-work distances than females. Between 1991 and 1996, the home-work distance increased for both male and female workers of the GTA.

Exhibit 3.25: Median Straight-Line Distance Between Home and Work by Gender

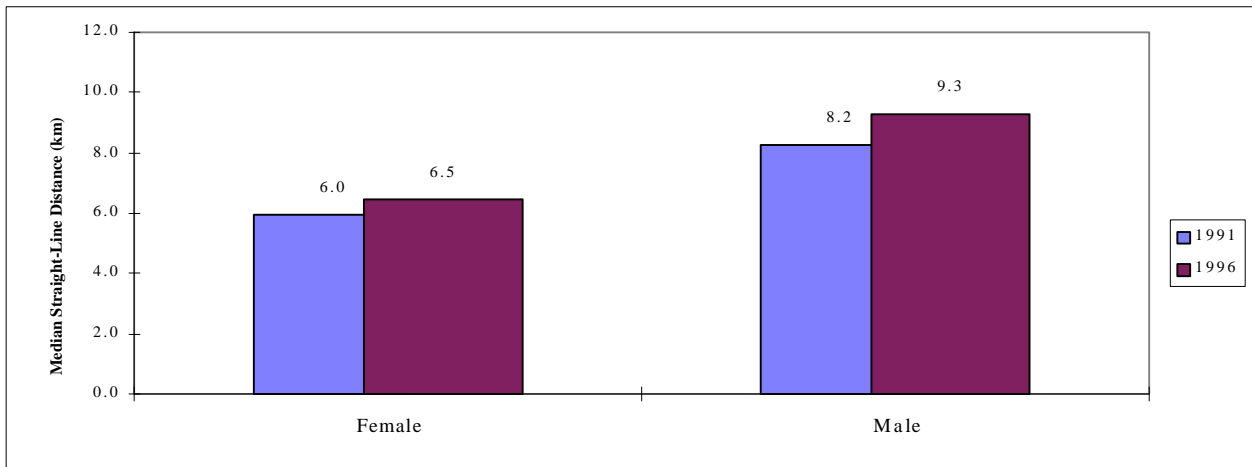
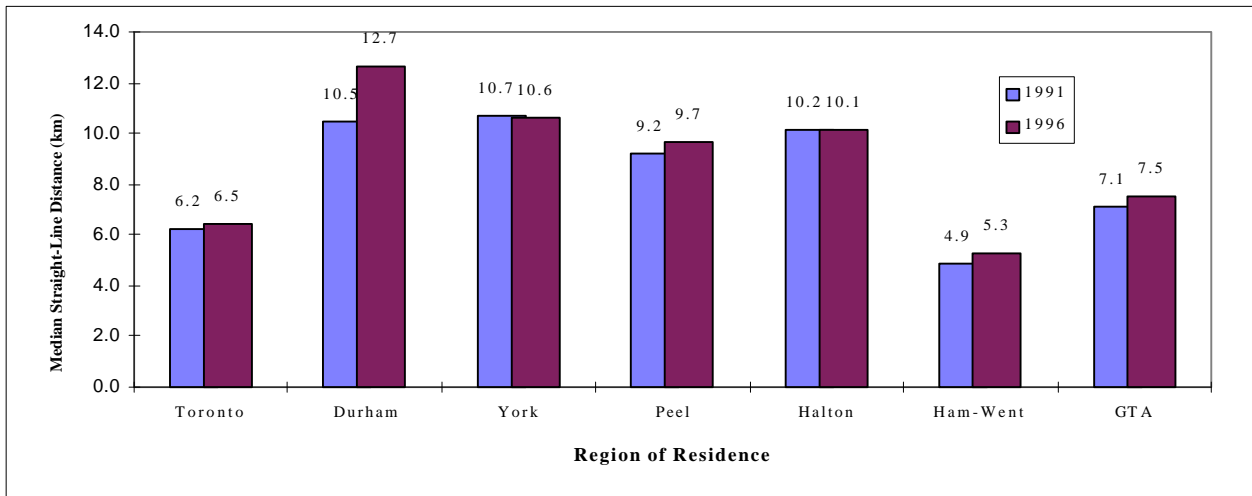


Exhibit 3.26 shows the home-work distance by region of residence of workers. In general, the home-work distance is shortest for residents of Toronto and Hamilton-Wentworth.

Exhibit 3.26: Median Straight-Line Distance Between Home and Work by Region of Residence



As observed earlier, self-containment of these two regions declined between 1991 and 1996, as the number of workers residing and working in the same region declined while the number of workers in each region who work elsewhere increased. This resulted in an overall increase in the median home-work distance for workers residing in Toronto and Hamilton-Wentworth. Similarly, Durham's self-containment declined between 1991 and 1996 which resulted in a rather large increase in the median home-work distance for workers of this region. In contrast, York and Halton's self-containment improved between 1991 and 1996 which resulted in a reduction in the home-work distance in these two regions. Even though Peel's self-containment improved between 1991 and 1996, the home-work distance increased which could be due to further sprawl of jobs and housing within Peel.

Since most of the growth in the workforce between 1991 and 1996 occurred by workers aged between 31 and 50, who generally have higher home-work distance than workers in other age groups, and by workers residing outside Toronto, who generally have higher home-work distance than workers in Toronto, the median straight-line distance between home and work for all workers in the GTA increased from 7.1 km. in 1991 to 7.5 km. in 1996.

3.4 SUMMARY OF TRENDS AND PERSON TRAVEL DEMAND IMPLICATIONS

3.4.1 Trends

The most notable changes observed in the above characteristics are summarised in Exhibit 3.27.

3.4.2 Implications

Some travel demand implications based on the above trends include:

- increased dispersion of travel patterns in relation to the larger growth outside Toronto in low-density locations;
- reduced transit mode split for the work trip in relation to the declining role of PD 1 as the major employment centre in the GTA (i.e. decentralisation of employment);
- reduced transit mode split for the work trip in relation to the substantial reduction in the number of workers residing and working in Toronto;
- increased work-travel shares by the auto mode and GO Rail (i.e. commuter rail network connecting the 905 Belt mainly with PD 1) during the peak periods in relation to the increased proportion of workers residing in the 905 Belt and working in PD 1;
- increased auto mode split for the work trip in relation to the large increase in proportion of workers residing and working in the 905 Belt and in relation to the increase in reverse commuting between Toronto and the 905 Belt; and
- longer travel times and increased vehicle kilometres travelled (VKT) in relation to the increase in home-work distance.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 3.27: Summary of Urban Activity System Characteristics (1986-1996)

	1986	1991	1996	Change ¹			Comments
				1986-91	1991-96	1986-96	
Population Density (residents/sq. km.)							
Percent of low-density zones (0-1000)	49.2%	46.4%	42.2%	-2.8%	-4.2%	-7.0%	Reduction across the GTA
Percent of medium-density zones (1000-8000)	45.2%	47.9%	51.3%	2.7%	3.4%	6.1%	Increase mainly in the 905 Belt
Percent of high-density zones (> 8000)	5.6%	5.7%	6.5%	0.1%	0.8%	0.9%	Increase in Toronto and reduction in Ham-Went
Average zonal density ('000s) in:							
GTA	2.25	2.42	2.60	7.5%	7.2%	15.3%	
Toronto	4.35	4.52	4.80	4.0%	6.1%	10.3%	
905 Belt	1.19	1.36	1.48	14.0%	9.2%	24.5%	
Employment Density (jobs/sq. km.)							
Percent of low-density zones (0-1000)	NA	58.9%	54.9%	NA	-4.0%	NA	Reduction mainly in the 905 Belt
Percent of medium-density zones (1000-8000)	NA	40.2%	44.3%	NA	4.1%	NA	Increase mainly in the 905 Belt
Average zonal density ('000s) in:							
GTA	NA	1.23	1.24	NA	0.7%	NA	
Toronto	NA	2.34	2.30	NA	-1.8%	NA	
905 Belt	NA	0.67	0.70	NA	5.0%	NA	
Self Containment							
% GTA's ELF living & working in same region	77.2%	73.5%	71.6%	-3.7%	-1.9%	-5.6%	Improvement only in York (86-96), Peel (86-91) and Halton (91-96)
Spatial Markets							
PD 1 Employment							
% of PD1 workers from Toronto	81.9%	77.8%	73.4%	-4.1%	-4.4%	-8.5%	Reduction mainly by workers from adjacent zones
% of PD1 workers from the 905 Belt	18.1%	22.2%	26.6%	4.1%	4.4%	8.5%	Increase mainly by workers from York and Peel
ELF residing in Toronto and working in							
Toronto (as a % of GTA ELF)	47.7%	42.1%	38.6%	-5.6%	-3.5%	-9.1%	
the 905 Belt (as a % of GTA ELF)	6.2%	6.8%	7.4%	0.6%	0.6%	1.2%	Increase mainly by workers in York
ELF residing in the 905 Belt and working in							
same 905-Belt region (as a % of GTA ELF)	29.5%	31.4%	33.0%	1.9%	1.6%	3.5%	Increase in York and Peel, reduction in Ham-Went
other 905-Belt region (as a % of GTA ELF)	4.2%	5.4%	6.1%	1.1%	0.8%	1.9%	
Toronto (as a % of GTA ELF)	12.4%	14.4%	14.9%	1.9%	0.5%	2.5%	
Home-Work Distance							
Straight-Line distance (km.)	NA	7.09	7.48	NA	5.6%	NA	Largest increase (2.2 km.) for ELF from Durham, slight reduction for ELF from York and Halton

¹ The change in any "Percent" from year 1 to year 2 is calculated as the Percent in year 2 minus that in year 1. Otherwise, the change is calculated as the percentage change, that is, the number in year 2 minus the number in year 1 divided by the number in year 1.

4. MOBILITY CHARACTERISTICS

This chapter presents an examination of changes in mobility characteristics of the GTA residents. These characteristics are related primarily to possession of a driver's licence and household vehicles. The chapter also includes an examination of overall changes in vehicle mobility for the GTA workers, including availability of parking at the usual place of work.

4.1 CHARACTERISTICS OF LICENCED DRIVERS

4.1.1 Driver's Licence Possession Rate

In general, the possession rate of a driver's licence for older females, aged more than 40, increased steadily between 1986 and 1996, as shown in Exhibit 4.1. During the same period, the possession rate of a driver's licence for younger females increased between 1986 and 1991, then decreased in the following 5 years, particularly females aged 16 to 20. This could be due to the recently introduced "graduated licence" program and the increased vehicle insurance expenses. Young males aged 16 to 20 displayed patterns of change similar to those of females of the same age group, as shown in Exhibit 4.2. However, the exhibit shows minor changes for older males. The above changes did not result in a significant reduction of the gap between males and females in terms of possession of a driver's licence. In total, slightly more than 70% of all adult females (age >= 16) in 1996 had a driver's licence while the corresponding figure for males was slightly less than 90%.

Exhibit 4.1: Possession Rate of a Driver's Licence by Age for Females

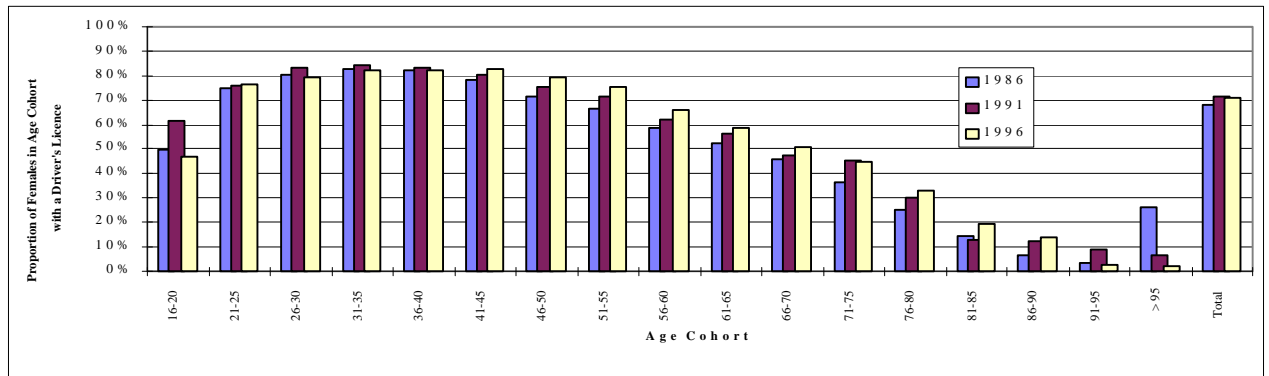


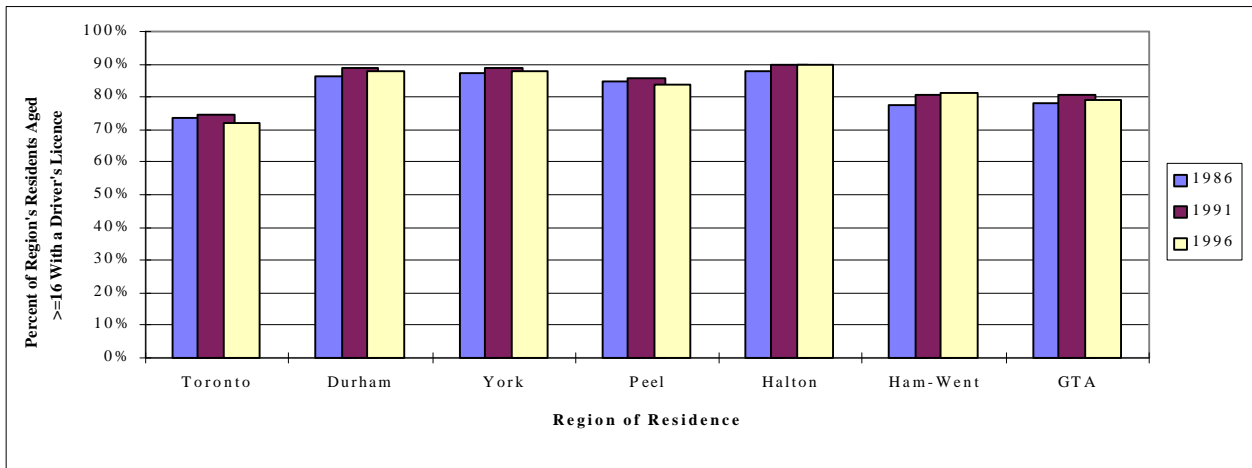
Exhibit 4.2: Possession Rate of a Driver's Licence by Age for Males



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 4.3 shows that the residents of the GTA regions, with the exception of Hamilton-Wentworth, showed similar patterns of change. The proportion of adult residents of Toronto with a driver's licence increased between 1986 and 1991 then decreased to slightly more than 70% in 1996. With the exception of Hamilton-Wentworth, the proportion of adult residents of the 905 Belt with a driver's licence increased between 1986 and 1991 then decreased to slightly less than 90% in 1996.

Exhibit 4.3: Possession Rate of a Driver's Licence by Region of Residence



4.1.2 Number and Distributions of Licenced Drivers

The number of licenced drivers increased by 15%, from 2.5 millions in 1986 to 2.87 in 1991, and by 5.6% in the following five years to reach a level of 3.04 millions in 1996. The proportion of licenced drivers who were females increased from 44.7% in 1986 to 45.4% in 1991 and 46.5% in 1996.

Exhibits 4.4 and 4.5 show the age distributions of licenced female drivers and licenced male drivers, respectively. In general, the two exhibits show a sharp reduction in the proportion of licenced drivers aged 16 to 30 in both five-year periods and a corresponding increase in the proportion of older licenced drivers. This is likely due to the increased proportion of older persons and the increased possession rate of a driver's licence for older females, as discussed earlier.

Exhibit 4.4: Distribution of Licenced Female Drivers by Age

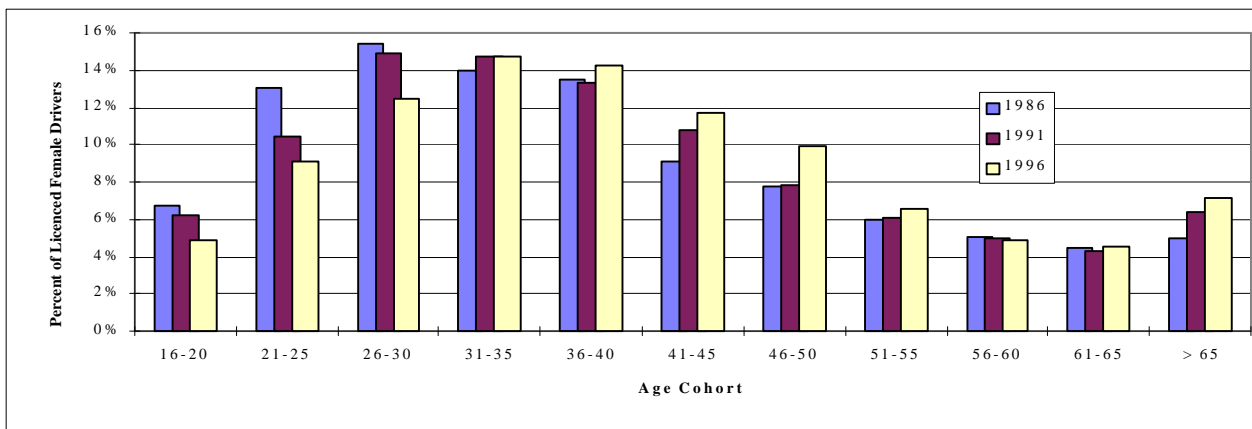


Exhibit 4.5: Distribution of Licenced Male Drivers by Age

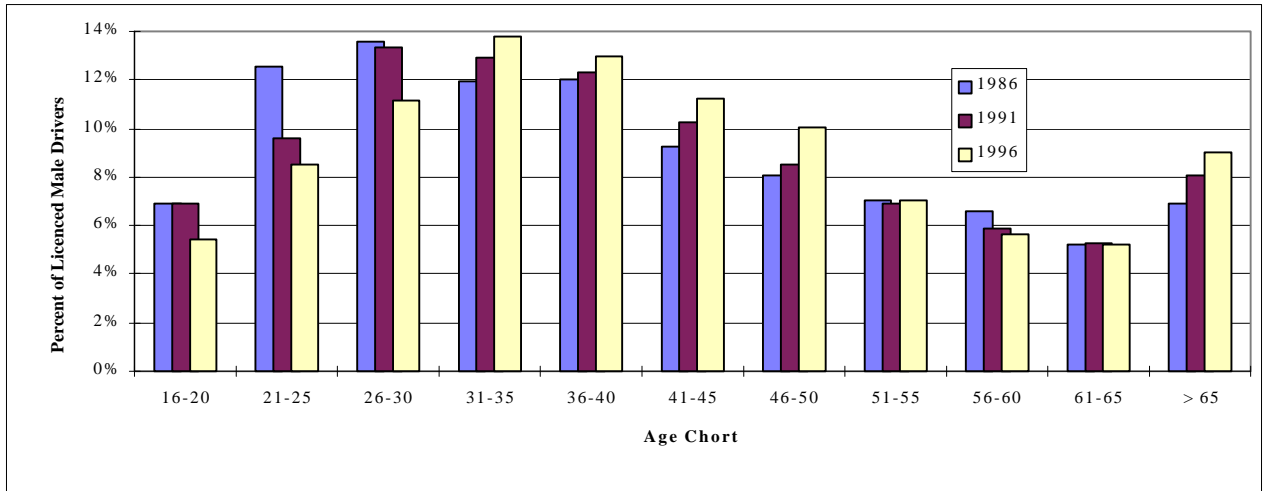
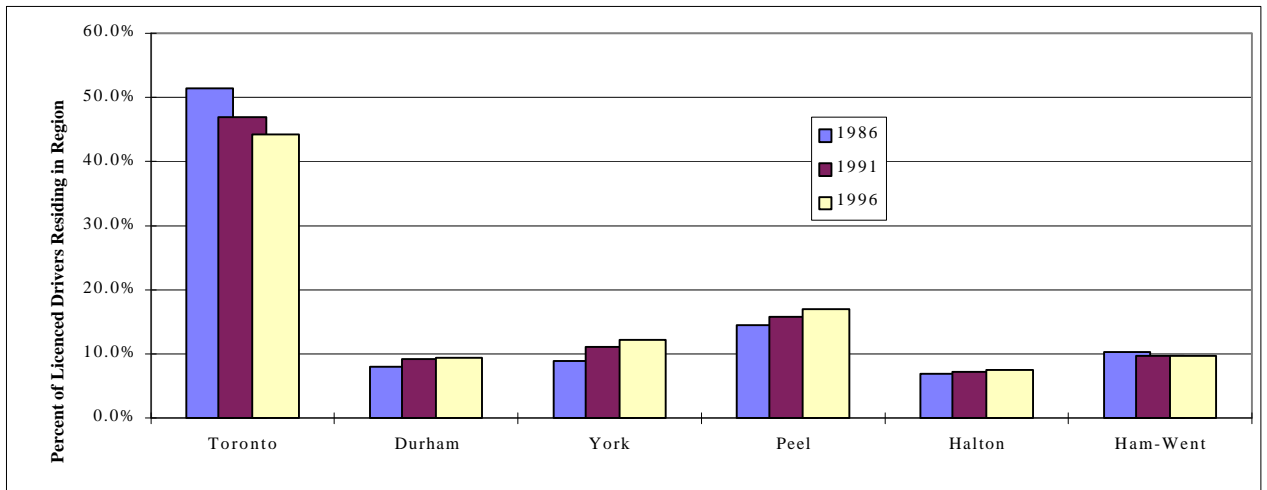


Exhibit 4.6 shows that the proportion of the GTA licenced drivers who reside in Toronto declined steadily from 51.3% in 1986 to 46.9% in 1991 and 44.3% in 1996. In contrast, the proportion of licenced drivers residing in York and Peel increased while the proportions for other regions changed slightly. This change in the regional distribution of the licenced drivers is more likely linked to the change in the regional distribution of the GTA population than the change in driver’s licence possession rate in the regions.

Exhibit 4.6: Distribution of Licenced Drivers by Region of Residence



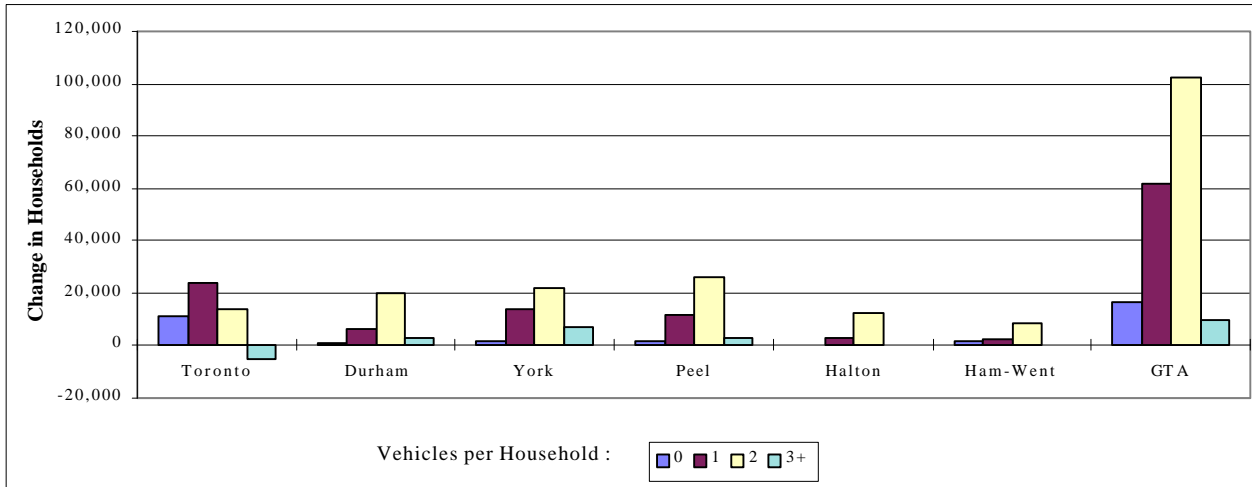
4.2 HOUSEHOLD VEHICLES

4.2.1 Household Vehicle Ownership

Between 1986 and 1991, most of the growth in the GTA households was by households having 1 or 2 vehicles, as shown in Exhibit 4.7. In Toronto, the number of households having one vehicle increased more than any other household type, followed by households having two vehicles, while the number of households with three vehicles or more declined. In contrast, the number of households having two vehicles increased in each 905-Belt region more than any other household type, followed by households having one vehicle.

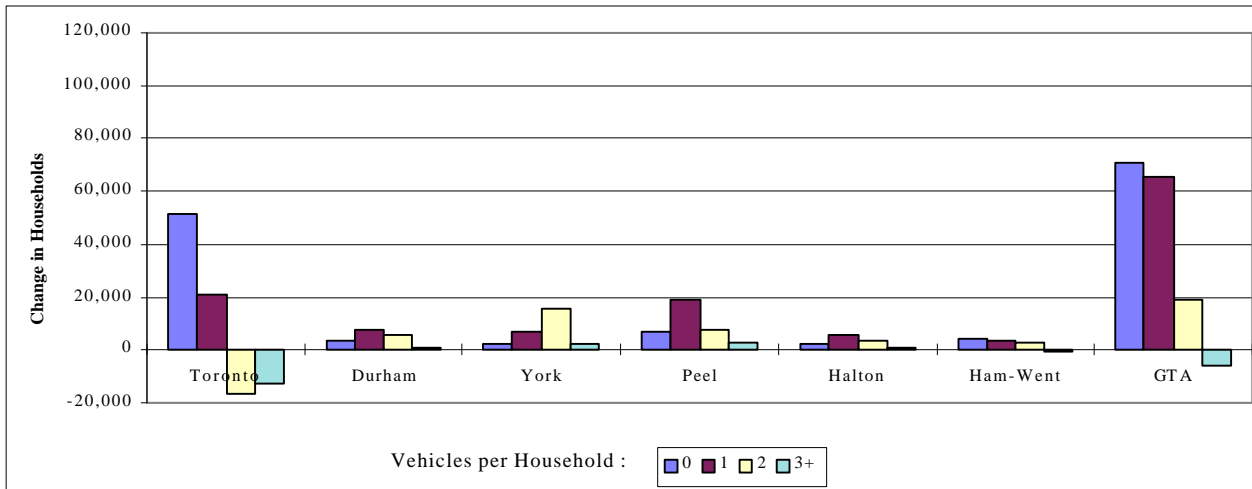
Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Exhibit 4.7: Change in Households by Number of Household Vehicles - 1986-1991



Between 1991 and 1996, the increase in the number of households having 0 or 1 vehicle accounted for most of the growth in the GTA households, as shown in Exhibit 4.8. In Toronto, the number of households having no vehicles accounted for most of the local growth, followed by households having one vehicle, while households having two or more vehicles dropped in number. In sum, Toronto experienced a net reduction of 7,440 in the number households having vehicles. In the 905 Belt, households with all vehicle ownership levels increased, but unlike the previous five years, households having one vehicle increased in number more than households having two vehicles, with the exception of York.

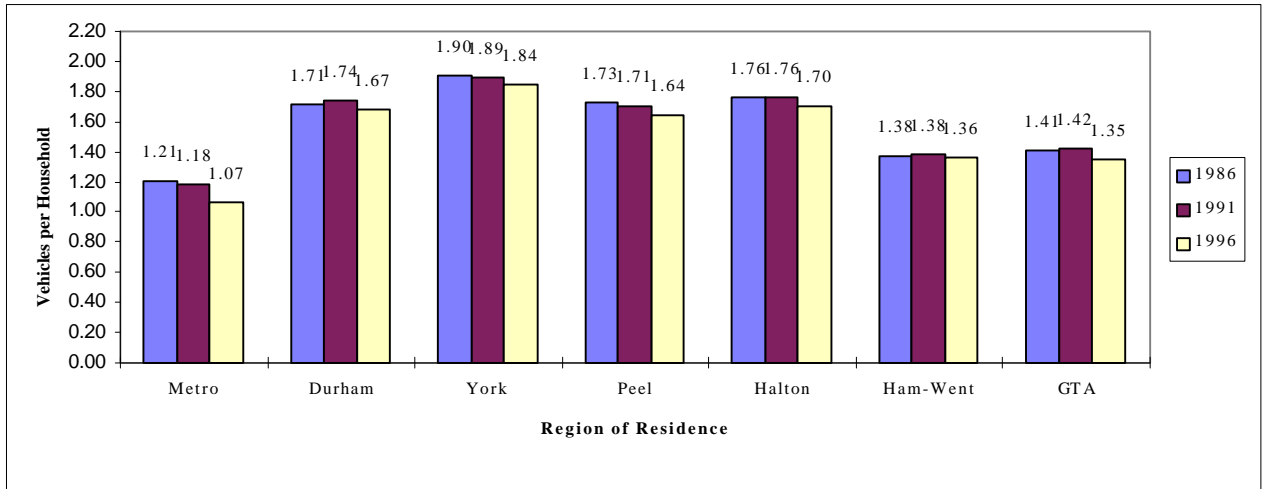
Exhibit 4.8: Change in Households by Number of Household Vehicles - 1991-1996



The above changes led to a reduction in the number of vehicles per household in Toronto between 1986 and 1996, as shown in Exhibit 4.9. However, the reduction was more pronounced in the last five years than the previous five years. In the 905 Belt, the number of vehicles per household changed slightly between 1986 and 1991 then dropped in the following five years in all 905-Belt regions. The number of vehicles per household in the 905 Belt, at 1.64 in 1996, was still much larger than the corresponding number in Toronto, at 1.07. The change in household vehicle holdings observed here is likely due to the changes in household size and number of workers per household observed earlier.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

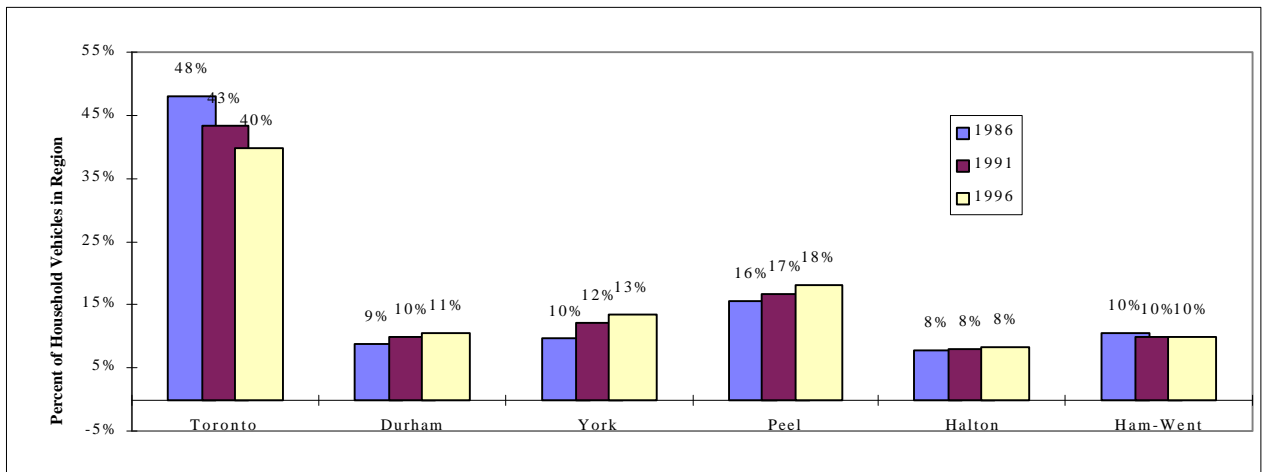
Exhibit 4.9: Average Number of Vehicles per Household by Region of Residence



4.2.2 Number and Regional Distribution of Household Vehicles

The total number of household vehicles increased by 13.7%, from 2.07 millions in 1986 to 2.35 in 1991, and by 3.6% in the following five years to reach a level of 2.44 millions in 1996. Exhibit 4.10 shows that the proportion of the GTA household vehicles owned by households in Toronto declined steadily from 47.8% in 1986 to 43.3% in 1991 and 39.8% in 1996. In contrast, the proportions for the 905-Belt regions, with the exception of Hamilton-Wentworth, increased.

Exhibit 4.10: Distribution of GTA Household Vehicles by Region of Household



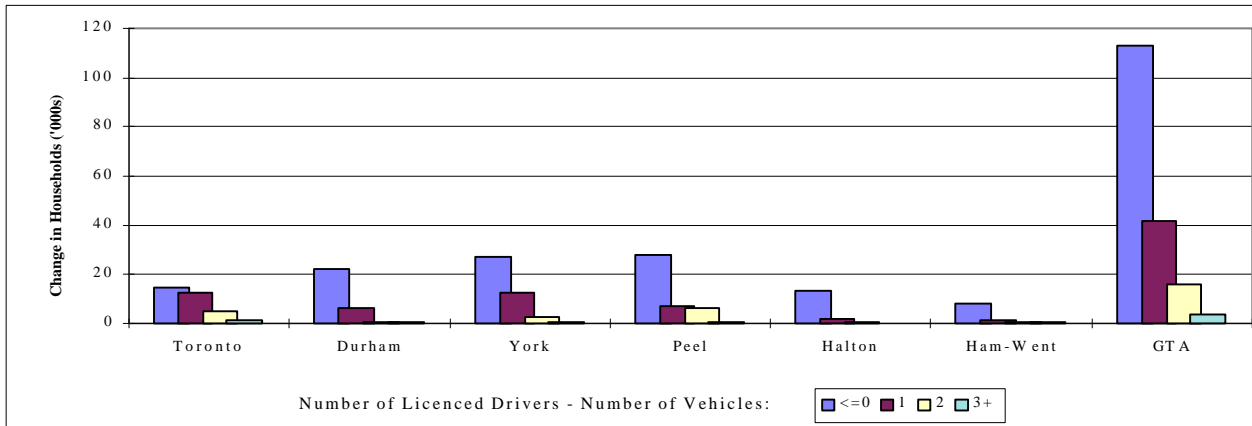
4.2.3 Vehicle Availability

The increase in the number of households having no vehicles is reflected in the preceding sections. Persons residing in such households are not likely to have access to vehicles in other households. Of interest here is the degree of availability of vehicles to licensed drivers in households having at least one vehicle. Exhibit 4.11 shows the 1986-1991 changes in the number of households by the difference between the number of licensed drivers and the number of available vehicles in the same household, which provides an indication of the competition between the household licenced drivers for the available household vehicles. It shows that

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

between 1986 and 1991, the number of households in Toronto having at least one vehicle per licenced driver increased almost as much as the increase in the number of households having two licensed drivers for each available vehicle in the household. Outside Toronto, most of the increase was in households having at least one vehicle per licenced driver.

Exhibit 4.11: Change in Number of Vehicle-Owning Households by Vehicle Availability - 1986-91



As observed earlier, the number of Toronto households having at least one vehicle dropped between 1991 and 1996. Almost all of the reduction was in households having at least one vehicle per licenced driver, as shown in Exhibit 4.12. Similar to the previous five years, the increase outside Toronto was mainly in households having at least one vehicle per licenced driver.

Exhibit 4.12: Change in Number of Vehicle-Owning Households by Vehicle Availability - 1991-96

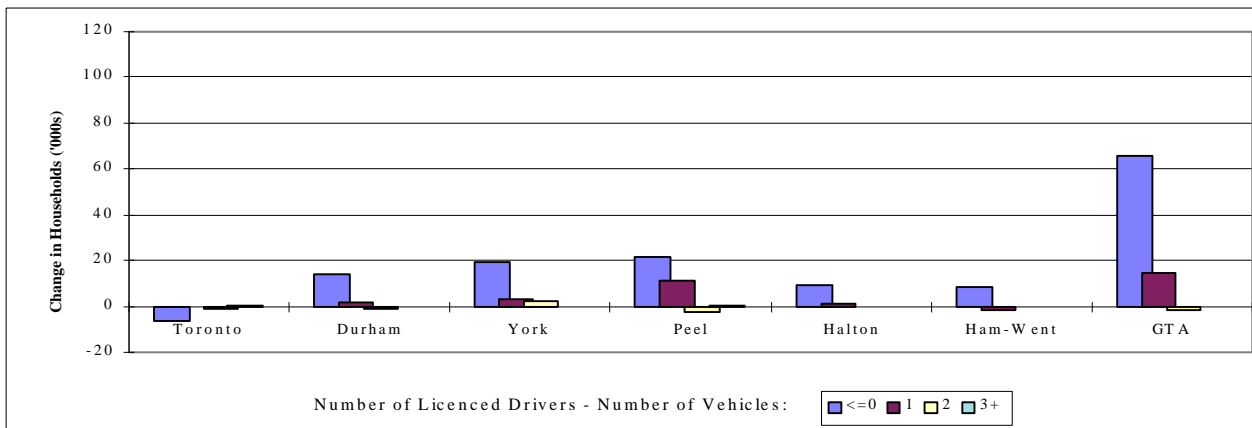
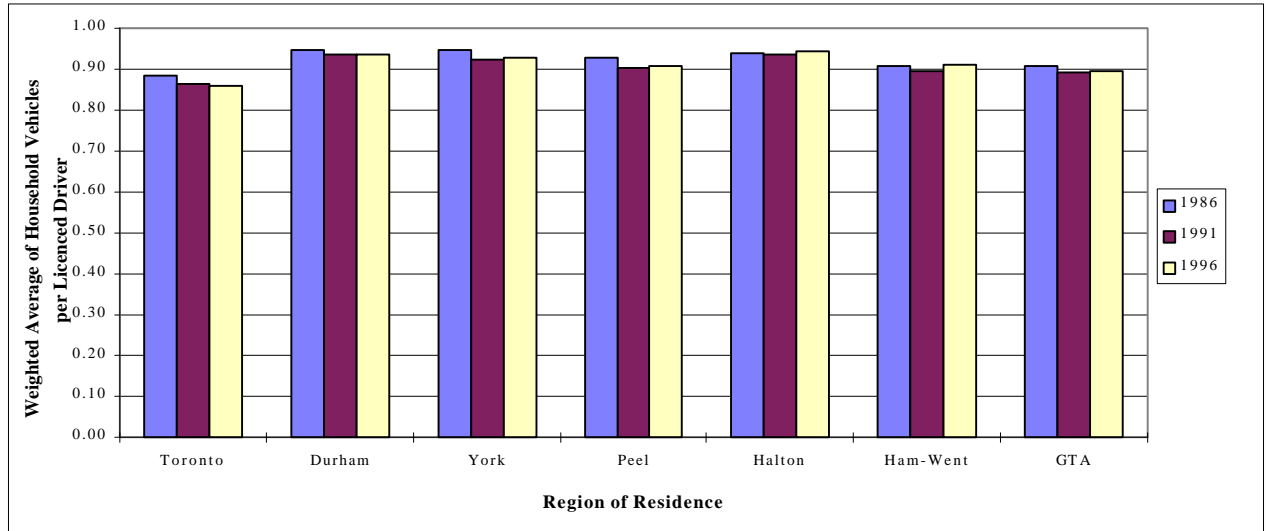


Exhibit 4.13 shows the changes in a measure of vehicle availability per licenced driver. Since licenced drivers are not likely to have access to vehicles in other households, this measure is calculated as the number of vehicles per licenced driver in the same household, weighted by the frequency of the vehicle-licensed driver combination, and summed over all combinations of household vehicles and licensed drivers. Surprisingly, changes in this measure were relatively small across time and across space. This indicates that changes in household size and composition might have little bearing on changing personal vehicle ownership levels. The large value of this measure across the GTA, around 0.9, may also indicate that in households

having at least one vehicle, adults are likely to obtain a driver's licence when the household vehicles are highly available, independent of spatial location.

Exhibit 4.13: Vehicle Availability by Region of Residence



4.3 MOBILITY BY PERSONAL VEHICLES FOR WORKERS

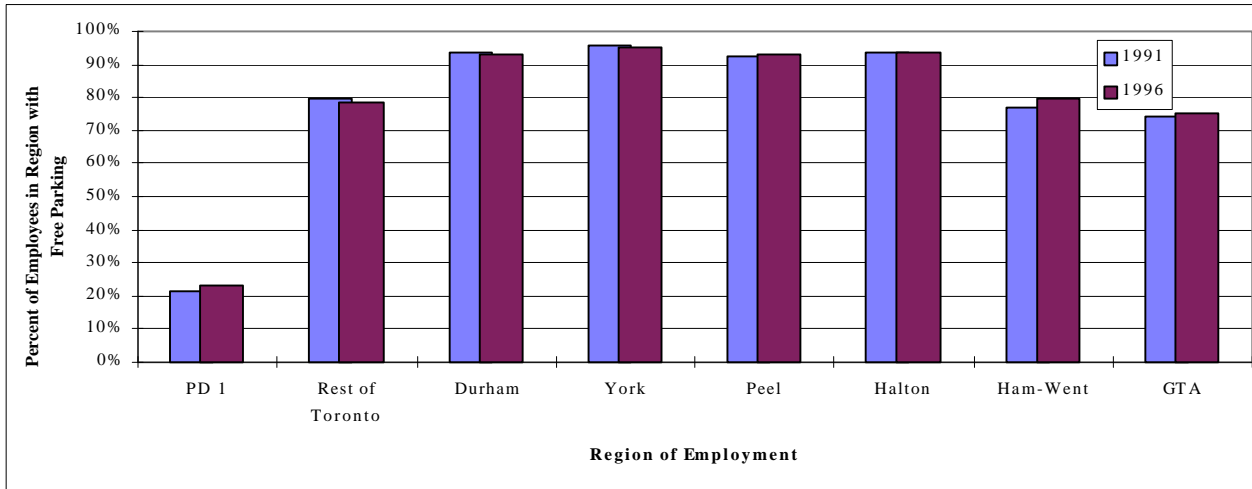
Since the GTA workers generate the majority of the travel made during the peak periods, this section examines changes in mobility by personal vehicles for the GTA workers. The components of vehicle mobility considered here include the possession of a driver's licence and the availability of household vehicles and free parking at the usual place of work. This section focuses on the changes between 1991 and 1996, since information on the usual place of work were collected in these two years only.

4.3.1 Free Parking Availability at Usual Place of Work

Exhibit 4.14 shows that free parking is available for more than 90% of workers in locations outside Toronto, with the exception of Hamilton-Wentworth. Around 20% of workers in PD 1 enjoy free parking at the place of work, while about 80% of workers in the rest of Toronto and the same proportion of workers in Hamilton-Wentworth enjoy free parking. These proportions changed very slightly between 1991 and 1996, with the most notable change was the increase of available parking for workers in Hamilton-Wentworth from 77% in 1991 to 80% in 1996. Overall, 75% of the GTA workers reported they had free parking at their place of work in 1996, up from 74% in 1991.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

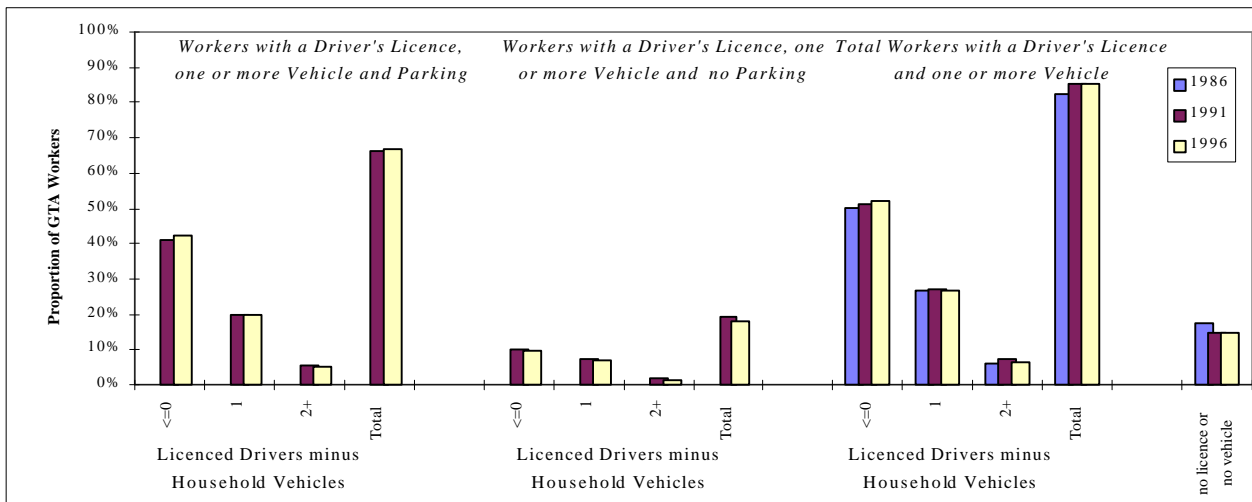
Exhibit 4.14: Proportion of Employees with Free Parking at Usual Place of Work



4.3.2 Distribution of GTA Workers by Vehicle and Parking Availability

Exhibit 4.15 shows that the proportion of GTA workers without a driver’s licence or with no vehicles at household declined from 17.5% in 1986 to 14.6% in 1991 but remained almost the same from 1991 to 1996. However, the proportion of GTA workers with a driver’s licence from households with at least one vehicle per licenced driver increased steadily from 50% in 1986 to 51% in 1991 and 52% in 1996. Most of the increase between 1991 and 1996 was by workers having free parking at the usual place of work. In fact, the proportion of GTA workers with a driver’s licence, at least one vehicle per household and free parking at the usual place of work increased slightly between 1991 and 1996, while the proportion of GTA workers with a driver’s licence, at least one vehicle per household but no free parking available declined. These changes are likely due to the increased proportion of older workers, urban sprawl of workers’ residential locations and decentralisation of jobs out of PD1 and Toronto.

Exhibit 4.15: Distribution of GTA Workers by Vehicle and Parking Availability



Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

4.4 SUMMARY OF TRENDS AND PERSON TRAVEL DEMAND IMPLICATIONS

4.4.1 Trends

The changes in mobility characteristics are summarised in Exhibit 4.16.

Exhibit 4.16: Summary of Mobility Characteristics (1986-1996)

	1986	1991	1996	Change ¹		
				1986-91	1991-96	1986-96
Licensed Drivers						
Driver's Licence Possession Rate for:						
GTA Residents aged 16 or above	78.3%	80.4%	79.0%	2.1%	-1.4%	0.7%
Persons aged 16 to 20	56.0%	66.1%	52.5%	10.1%	-13.6%	-3.5%
Persons aged 21 to 40	86.5%	87.5%	86.1%	1.0%	-1.4%	-0.5%
Persons aged 41 or above	74.1%	75.6%	76.8%	1.6%	1.2%	2.7%
Females aged 16 or above	68.3%	71.3%	70.7%	3.1%	-0.7%	2.4%
Males aged 16 or above	88.8%	89.8%	88.0%	0.9%	-1.8%	-0.8%
Toronto Residents aged 16 or above	73.4%	74.5%	72.1%	1.1%	-2.4%	-1.3%
905-Belt Residents aged 16 or above	84.2%	86.4%	85.6%	2.2%	-0.9%	1.3%
Licensed drivers (millions)	2.50	2.87	3.04	14.9%	5.6%	21.4%
Percent of female licenced drivers	44.7%	45.4%	46.5%	0.7%	1.1%	1.8%
Percent of licenced drivers aged 16-30	34.0%	30.6%	25.7%	-3.3%	-5.0%	-8.3%
Percent of licenced drivers aged 31-55	49.2%	51.8%	56.0%	2.5%	4.2%	6.8%
Percent of licenced drivers aged 56-65	10.8%	10.3%	10.2%	-0.5%	-0.1%	-0.6%
Percent of licenced drivers aged 66 or over	6.0%	7.3%	8.1%	1.3%	0.8%	2.1%
% of licenced drivers residing in Toronto	51.3%	46.9%	44.3%	-4.4%	-2.6%	-7.0%
% of licenced drivers in Durham, York or Peel	31.4%	36.1%	38.7%	4.7%	2.6%	7.3%
Household Vehicles						
Percent of households with 0 vehicles	14.8%	14.1%	16.9%	-0.7%	2.8%	2.0%
Number of vehicles per household in:						
GTA	1.41	1.42	1.35	0.7%	-4.9%	-4.3%
Toronto	1.21	1.18	1.07	-2.2%	-9.4%	-11.4%
905 Belt	1.67	1.69	1.64	0.7%	-2.8%	-2.1%
Household vehicles (millions)	2.07	2.35	2.44	13.7%	3.6%	17.8%
Percent of household vehicles in:						
Toronto	47.8%	43.3%	39.8%	-4.5%	-3.5%	-8.0%
Durham, York and Peel	34.1%	38.8%	42.0%	4.7%	3.2%	7.9%
Vehicle availability (vehicles/driver) in:						
Toronto	0.88	0.87	0.86	-1.8%	-0.7%	-2.4%
905 Belt	0.93	0.92	0.92	-1.6%	0.7%	-0.9%
GTA	0.91	0.89	0.90	-1.4%	0.3%	-1.2%
ELF Mobility by Vehicles						
Percent of region's ELF with free parking:						
PD 1		21.7%	23.2%		1.5%	
Rest of Toronto		79.7%	78.5%		-1.1%	
905 Belt		90.7%	91.6%		0.9%	
GTA		74.0%	75.2%		1.2%	
% of ELF with no licence or no vehicle	17.5%	14.6%	14.8%	-2.9%	0.3%	-2.6%

¹ The change in any "Percent" from year 1 to year 2 is calculated as the Percent in year 2 minus that in year 1. Otherwise, the change is calculated as the percentage change, that is, the number in year 2 minus the number in year 1 divided by the number in year 1

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

4.4.2 Implications

Some travel demand implications based on the above trends include:

- increased trip rate and proportion of auto-driver trips due to the overall increase in driver's licence possession rate (particularly by females aged 41 or over), the increased proportion of licenced drivers aged 31-55 and over 65, and the increase proportion of licenced drivers residing outside Toronto; and
- increase in auto-driver mode split for the work trip in PD 1 and Hamilton-Wentworth between 1991 and 1996 in relation to the increased proportion of employees with available parking.

5. TRANSPORTATION SYSTEM CHARACTERISTICS

No detailed analysis was made of changes in characteristics of the transportation system between 1986 and 1996. However, other studies have shown that the levels of congestion on the road network, particularly on freeways, have been rising fairly substantially, mainly due to the increasing levels of travel demand and limited freeway network expansion (Ministry of Transportation 1997). It is reported that in 1986, 40 % of total GTA freeway kilometres operated under severely congested conditions, at Volume/Capacity exceeding 0.95. This percentage increased to 60% in 1991, and it is expected to have also increased substantially in the following five years.

Assuming insignificant changes in the transit level of service, the increased levels of congestion on the road network would likely mitigate any increase in auto-driver mode split and encourage public transit use and car-pooling.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

6. SUMMARY OF TRENDS AND IMPLICATIONS

Part 1 of this study examined changes in travel-related factors in the GTA between 1986 and 1996, using the 1986, 1991 and 1996 waves of the Transportation Tomorrow Survey. These factors are divided into five categories: demographic, socio-economic, urban activity system, mobility and transportation system. The first four categories are dealt with in a far greater detail than the last. Exhibits 1.17, 2.30, 3.27 and 4.16 present summary tables of changes in demographic, socio-economic, urban activity system and mobility characteristics, respectively. In words, these changes include:

- increased population;
- faster growth of population outside Toronto and Hamilton-Wentworth (i.e. urban sprawl);
- reduced household size;
- reduced population of persons aged 16 to 30 and increased population of persons of other age groups;
- reduced employed labour force participation rate, more so for workers aged 16 to 25, males or residents of Toronto;
- reduced workforce residing in Toronto and increased workforce residing elsewhere
- reduced proportion of full-time workers (mainly by males) and increased proportion of part-time workers;
- large increase in proportion of GTA households with no workers (occupied mainly by single or two adults only);
- decline in proportion of households with at least two full-time workers, particularly households occupied by two adults only;
- slight increase in population and employment densities;
- overall deterioration in self-containment;
- reduced significance of the central area employment market (i.e. employment decentralisation);
- increased proportion of central area workers residing outside Toronto;
- increased proportion of workers residing and working outside Toronto and reduced proportion of workers residing and working in Toronto;
- increased proportion of workers residing in/outside Toronto and working outside/in Toronto;
- increased home-work distance;
- increased proportion of persons aged 41 or more with a driver's licence, mainly females;
- reduced number of vehicles per household, particularly in Toronto where population of household vehicles dropped between 1991 and 1996;
- minor changes in personal auto availability levels across the GTA;
- increased parking availability, particularly in Hamilton-Wentworth;
- reduced proportion of workers with no driver's licence or no household vehicles; and
- increased congestion in the freeway network.

One of the interesting findings of this study is that despite the above changes in household size, composition and vehicle holdings, vehicle availability per licensed driver changed insignificantly with time and showed no significant differences between GTA locations. This indicates that changes in household size and composition might have little bearing on changing personal vehicle ownership levels. The relatively large number of vehicles per licensed driver in the GTA, around 0.9, may also indicate that in households having at least one vehicle adults are likely to obtain a driver's licence when the household vehicles are highly available, independent of spatial location.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

Individual changes in the above factors might have redundant, cumulative or conflicting implications for person travel demand. In general, however, the above changes imply increased total travel, increased proportion of discretionary travel, increased trip rate, increased dispersion of travel, longer travel times, increased shares by auto and GO Rail and reduced local transit mode split. Obviously, analysing stratified travel, for example by purpose and time of day, might show different patterns of change, but this depends on the relative significance of individual factors and the magnitude of changes in such factors. This is examined in more detail in Part 2 of this study.

Exploring Person Travel Trends in the Greater Toronto Area
Part 1: Changes in Travel-Related Factors and Implications for Travel Demand

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