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Exploring and Visualizing the Census Transportation Planning Package (CTPP) Urban and Statewide Elements

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I. Abstract

The purpose of this report is to document the types of transportation analyses that can be undertaken with the Census Transportation Planning Package (CTPP). In particular, this report focuses on exploring and visualizing the various elements of the CTPP data set. It is structured as a series of small-scale studies that have incorporated the use of CTPP data in order to generate information on a number of transportation-related topics. A general overview of each study is given, along with a description of the CTPP data used in the analysis, and a brief interpretation of the results. It is hoped that this report will acquaint transportation planners and planners undertaking corridor planning with the richness of the data contained in the CTPP.

II. Introduction to the Census Transportation Planning Package

The CTPP is a data set of special tabulations of 1990 census data designed to meet the needs of transportation planners. The CTPP is aggregated into two distinct levels, providing opportunities for both urban area and statewide analysis. The statewide element contains data for geographic areas such as states, counties, and places with 2,500 persons or more. Similarly, the urban element contains data for census tracts or blockgroups and custom geographic areas such as traffic analysis zones (TAZs). Each metropolitan planning organization (MPO) across the country was given the option of whether they wanted the data tabulated by census tract, census block group, or traffic analysis zone.

The statewide element is divided into three major components:

Statewide Element

Part A: Tabulation by place of residence. Characteristics of persons, workers, and housing units by county, places of 2,500 or more, and county subdivision.

Part B: Tabulation by place of work. Characteristics of workers by county, places of 2,500 or more, and county subdivision.

Part C: Characteristics of workers in journey to work flows between counties, places of 2,500 or more, and county subdivision of residence and counties and places of 2,500 or more of work.

The urban element also consists of three major components:

Urban Element

Part 1: Tabulation by place of residence. Characteristics of housing units, households, persons and workers living in the region.

Part 2: Tabulation by place of work. Contains data on people who worked in the region such as mode of travel to work, type of work, and travel time to work.

Part 3: Characteristics of workers in journey to work flows between Parts 1 and 2. Contains information on where individuals live in a region and where they reported for work. Limited to workers who did not work at home. Also contains information on mode of travel and time left for work in morning.

Both the statewide and urban elements provide a wealth of information that transportation planners can use to perform a number of different types of transportation studies. The following examples offer a glimpse into the types of analyses that can be performed with the CTPP.

III. Examples of Studies Using the Census Transportation Planning Package

A. Workplace Characteristics of Downtown Workers

- **Urban Element (Part 2)**

This study used the CTPP urban element, Part 2 place of work tabulation to determine the workplace characteristics of downtown workers in Portland, Oregon. Data were generated for mode use by income as well as mode use by gender. Table 1 shows the percentage of CBD and Lloyd District workers by income and commute mode. Figures 1 and 2 correspond to the same information. When interpreting the graphs and figures, it must be remembered that the universe is equal to 100% of the total trips for all modes.

Table 1: Percentage of CBD and Lloyd District Workers by Income and Commute Mode

CBD Workers	Earnings							
Mode	Less than $5,000	$5,000 - $14,999	$14,999 - $24,999	$25,000 - $34,999	$35,000 - $49,999	$50,000 - $74,999	More than $75,000	Total
Drove Alone	3.67%	10.40%	12.86%	12.54%	9.28%	4.75%	3.60%	57.11%
Carpool	0.99%	3.48%	4.96%	3.23%	2.20%	0.83%	0.38%	16.05%
Transit	2.24%	6.21%	7.24%	3.05%	1.95%	0.70%	0.13%	21.52%
Bike/Walk	0.81%	1.48%	0.87%	0.65%	0.37%	0.13%	0.05%	4.35%
Taxi	0.04%	0.26%	0.23%	0.14%	0.02%	0.03%	0.04%	0.76%
Worked at Home	0.08%	0.04%	0.02%	0.03%	0.04%	0.00%	0.00%	0.21%
Total	7.82%	21.86%	26.17%	19.66%	13.86%	6.43%	4.20%	100.00%

Table 1: Continued

Lloyd District Workers	Earnings							
Mode	Less than $5,000	$5,000 - $14,999	$14,999 - $24,999	$25,000 - $34,999	$35,000 - $49,999	$50,000 - $74,999	More than $75,000	Total
Drove Alone	5.26%	15.11%	19.57%	12.85%	10.51%	4.83%	2.08%	70.21%
Carpool	1.73%	4.12%	3.93%	2.78%	2.76%	0.85%	0.16%	16.34%
Transit	1.46%	3.35%	2.00%	1.23%	0.68%	0.31%	0.07%	9.10%
Bike/Walk	0.52%	1.23%	0.48%	0.23%	0.41%	0.02%	0.00%	2.87%
Taxi	0.27%	0.25%	0.05%	0.27%	0.20%	0.00%	0.05%	1.09%
Worked at Home	0.18%	0.10%	0.06%	0.00%	0.00%	0.04%	0.00%	0.38%
Total	9.42%	24.15%	26.09%	17.36%	14.57%	6.05%	2.36%	100.00%

Table 1 shows that Lloyd District workers have a higher share of single occupancy vehicle trips compared to CBD workers, whereas transit mode shares are higher for CBD workers. Additionally, the data show that the carpooling and transit mode shares are greater for low to moderate income commuters, with workers earning between $5,000 and $14,999 showing the highest shares. Figures 1 and 2 show that the net impact of persons making over $50,000 is negligible for all modes besides single occupancy vehicle trips. The figures also show that the highest bike/walk transit mode shares are for persons making between $5,000 and $14,999.

Figure 1: Percentage of CBD Workers by Income and Commute Mode

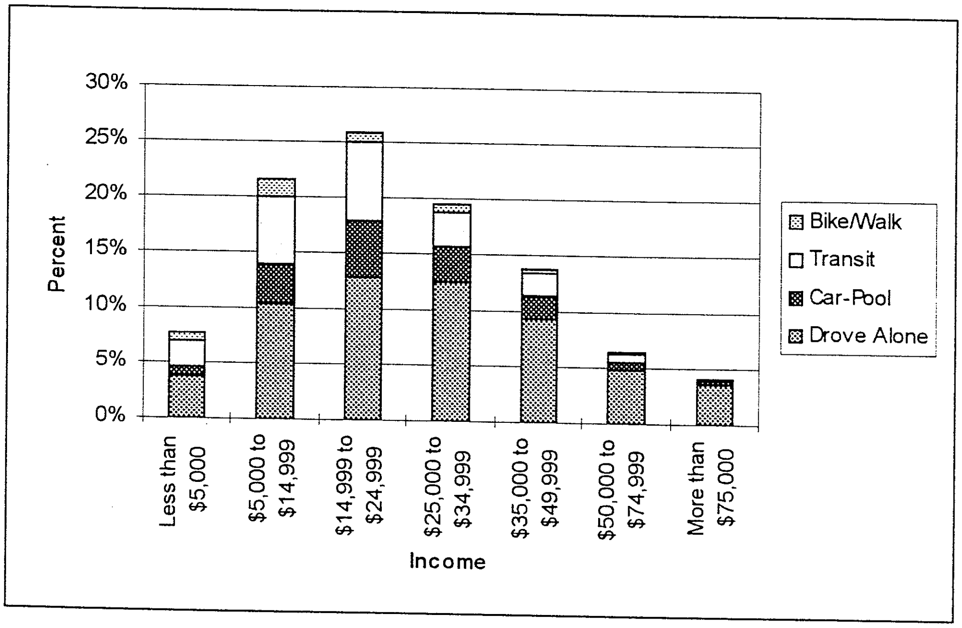


Figure 2: Percentage of Lloyd District Workers by Income and Commute Mode

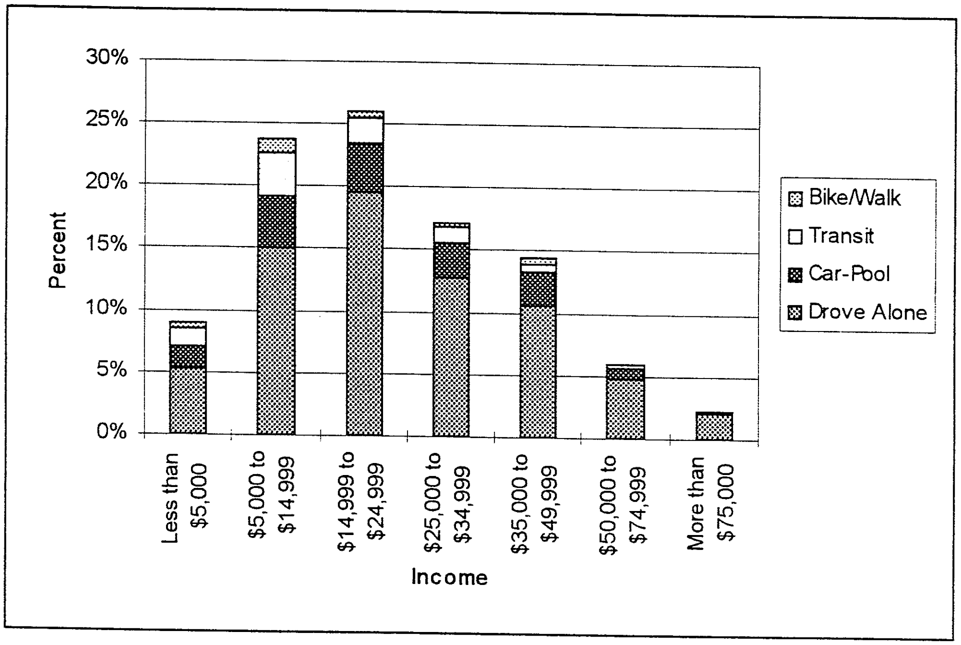
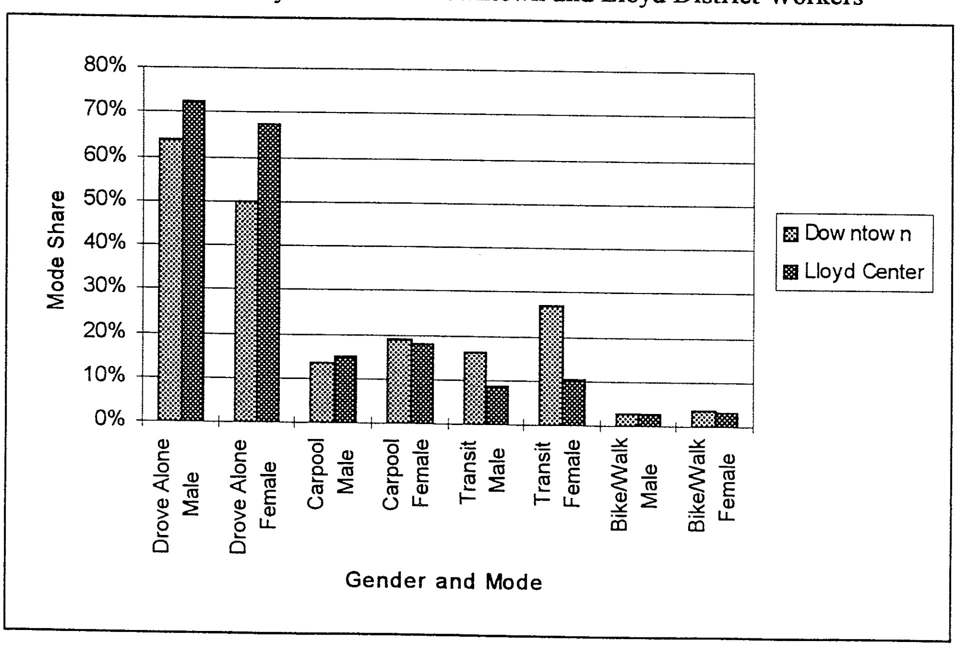


Figure 3 depicts mode shares for CBD and Lloyd District workers by gender. The graph shows that male workers exhibit a greater SOV mode share to both the CBD and the Lloyd District than females. In contrast, female workers are much more likely to use transit or carpool to both workplace locations.

Figure 3: Mode Share by Gender for Downtown and Lloyd District Workers



B. Jobs-Household Ratio for Selected Regional Centers

- Urban Element (Parts 1, 2, and 3)

Jobs-housing balance is often promoted as a viable mechanism for reducing traffic congestion. A closer look at the CTPP journey to work data reveals that balance, by itself, is not sufficient. Our examination of the CTPP data show that complex interregional commute flows exist. Our analysis used all three parts of the CTPP urban element to examine the jobs-household ratio and the commuting characteristics for selected regional employment centers in Portland, Oregon. The jobs-housing ratio was calculated for the home census tract of each regional employment center and for the subregion consisting of the central tract and it's adjacent tracts (Figure 4).

Figure 4: Jobs-Household Ratio for Selected Regional Centers

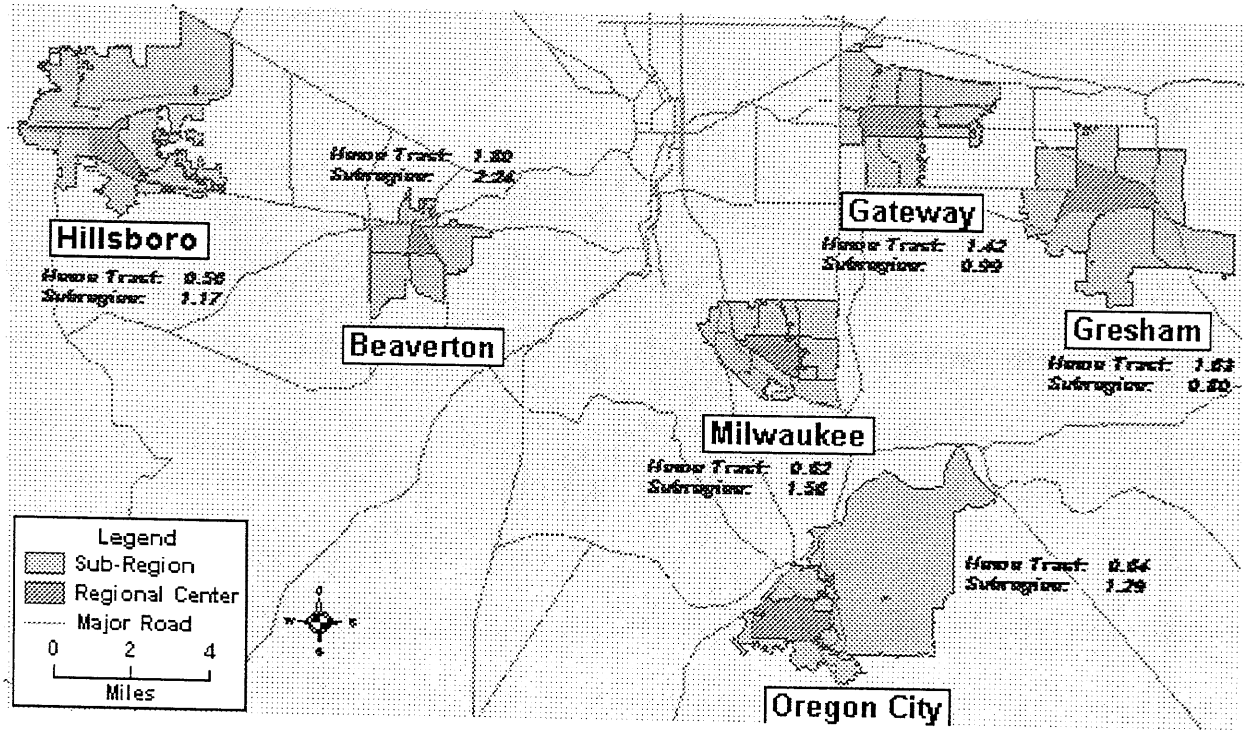


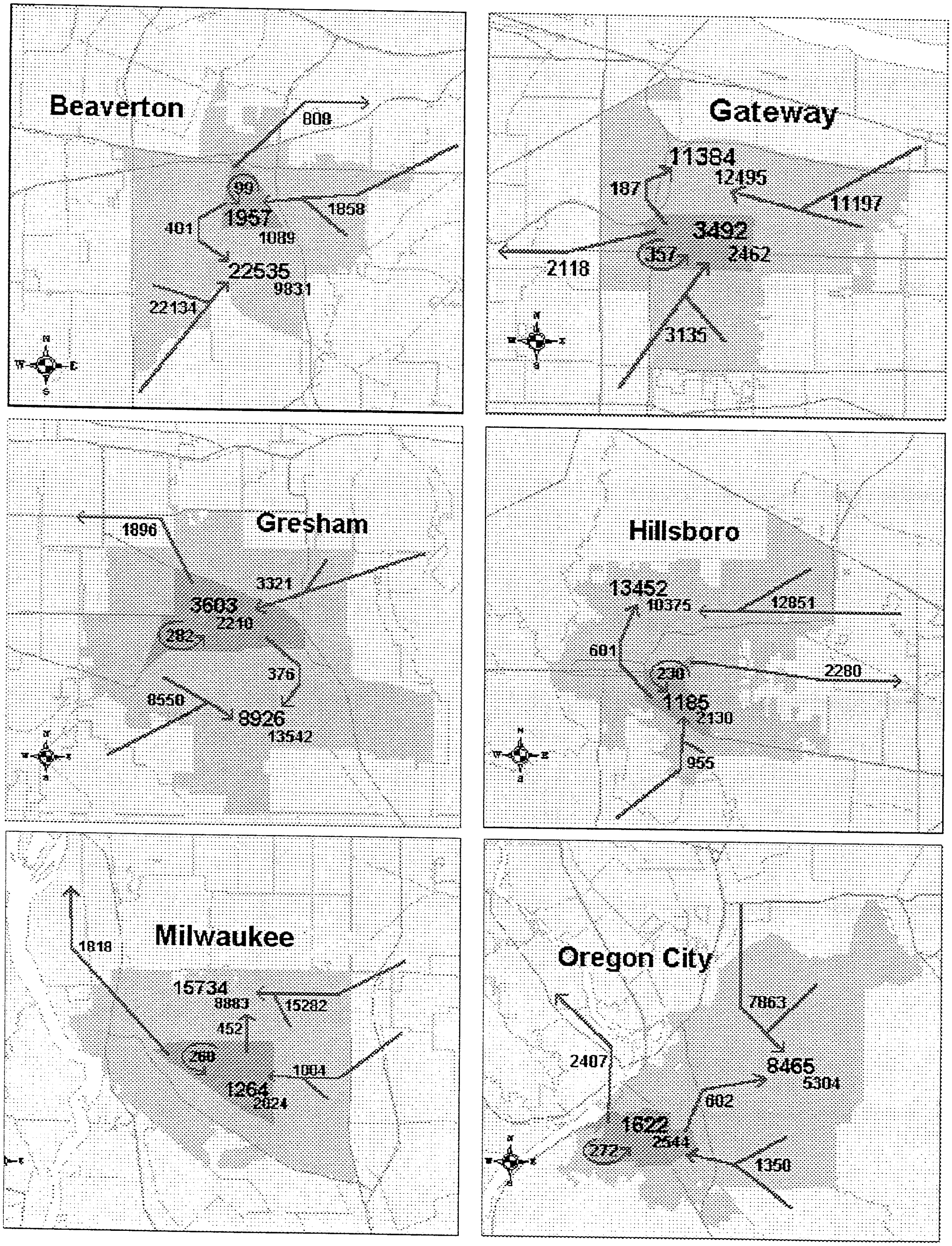
Table 2 shows the number of jobs and households for each employment center in addition to the jobs-household ratio. In addition, data showing the percentage of home tract workers living and working in the same geographic area are presented. For this particular study, employment regions with a jobs-household ratio between 0.90 and 1.40 are considered "balanced". The data show that none of the home census tracts can be considered balanced, with some areas being job poor an others job rich. Of the four subregions, three are found to have an adequate balance of jobs and households- Hillsboro, Oregon City, and Gateway.

Table 2: Household and Job Characteristics for Employment Regions

Employment Center		# Households	# Jobs	Jobs/Household Ratio	% of Home Tract Workers
Beaverton	Home Tract	1,089	1,957	1.80	7.57
	Subregion	10,920	24,492	2.24	38.23
Hillsboro	Home Tract	2,130	1,185	0.56	7.39
	Subregion	12,505	14,637	1.17	26.71
Milwaukee	Home Tract	2,024	1,264	0.62	10.28
	Subregion	10,907	16,998	1.56	28.14
Oregon City	Home Tract	2,544	1,622	0.64	8.29
	Subregion	7,848	10,087	1.29	26.64
Gateway	Home Tract	2,462	3,492	1.42	13.41
	Subregion	14,597	14,876	0.99	20.44
Gresham	Home Tract	2,210	3,603	1.63	11.04
	Subregion	15,752	12,529	0.80	25.76

Additional analysis looked at the commuting characteristics between each employment center and it's adjacent tracts as well as the commute flows between each employment center and the larger region. Results for the six employment centers are presented in Figure 5. For example, the employment center in Gateway has 3,492 jobs for 2,462 households. However, only 357 of those jobs are filled by residents of the central tract. The remaining 3,135 jobs are filled by residents from adjacent tracts or from tracts outside of the subregion. Likewise, the subregion contains 11,384 jobs for 12,495 households. Of those jobs, only 187 are filled by residents from the central tract. The remaining 11,197 jobs are filled by residents from adjacent tracts or from tracts outside of the subregion. Finally, 2118 workers (60.1%) of the workers from the central tract leave the subregion on the journey to work despite near perfect balance of jobs and households. Although Table 2 shows that jobs and housing are relatively balanced, closer inspection reveals that most of the residents work outside of the subregion, with most of the jobs filled by workers from other areas.

Figure 5: Commuting Characteristics for Selected Regional Centers



C. Journey to Work Characteristics for Selected Cities Near Salem

- Statewide Element (Part C)

This study used the CTPP statewide element, Parts A, B, and C to explore the journey to work characteristics for selected cities within and around the Salem Metropolitan Statistical Area (MSA). The analysis looked at journey to work flows by workplace and by place of residence for all trips. Figure 6 shows journey to work by workplace characteristics for selected cities located within commuting distance to the Salem MSA. Flows from locations outside of the Salem MSA to locations inside of the Salem MSA are presented. Data representing the percentage of trips arriving from locations external to the MSA are shown in the pie diagrams. For example, 9% of all work trips ending in Salem come from outside of the Salem MSA. The arrows show the number of external trips as well as the percentage of external trips to each interior location. For example, 722 of the trips arriving in Salem are attributable to Albany, representing 12% of all of Salem's external work trips originating outside of the MSA.

Figure 6: JTW by Workplace for Selected Cities Near Salem

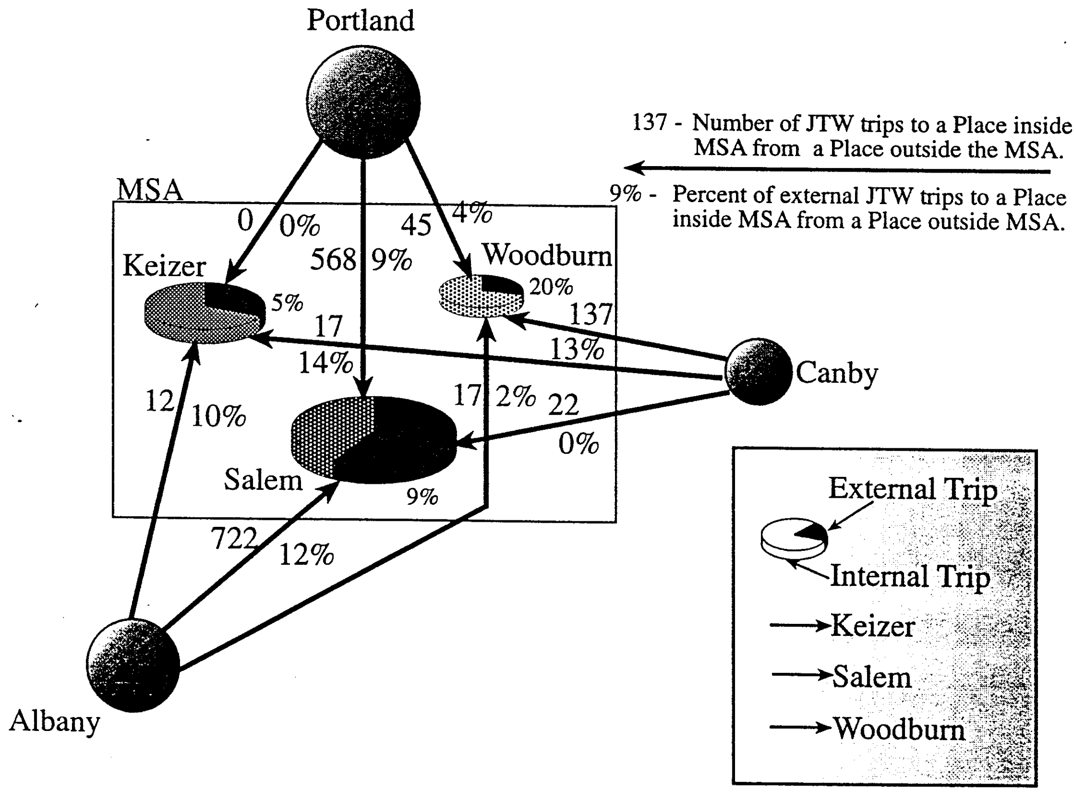
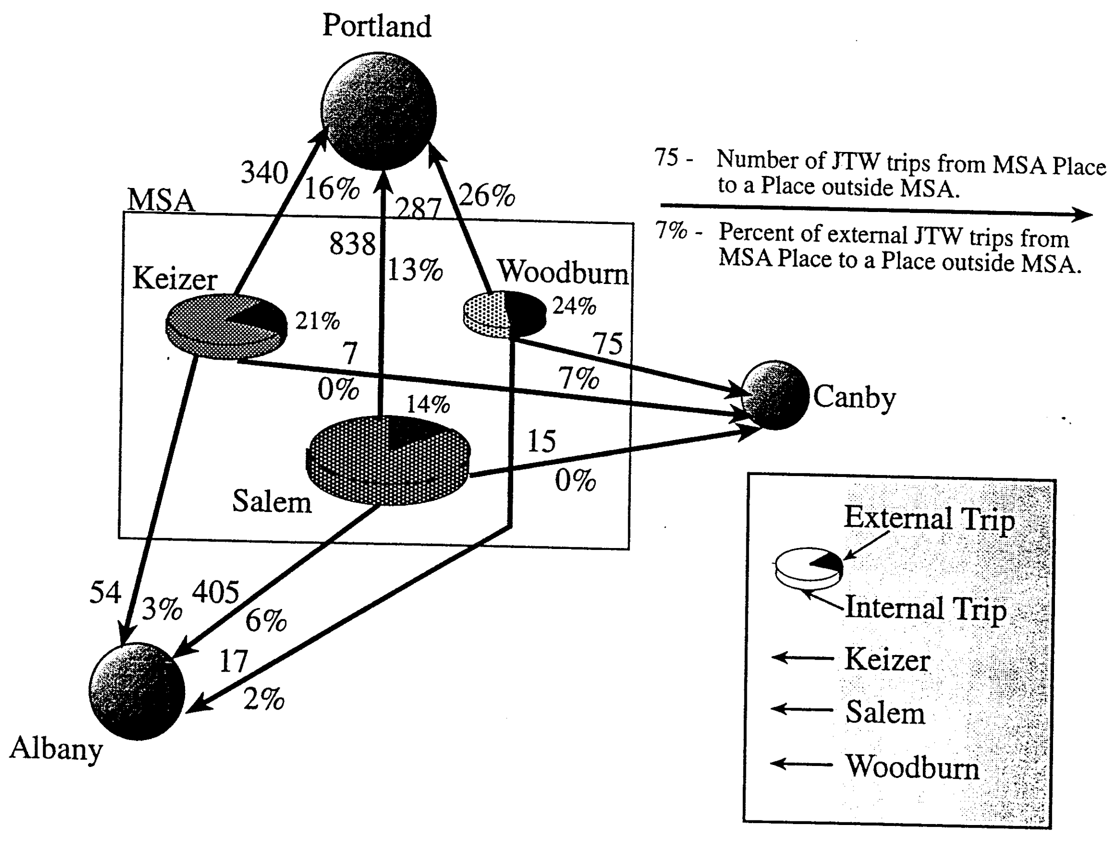


Figure 7 shows the journey-to-work flows originating from within the Salem MSA to selected locations outside of the MSA calculated by place of residence. The only difference between this figure and the preceeding one is that the arrows represent reverse flows to external locations. For example, 838 work trips originating in Salem are bound for Portland, representing 13% of Salem's total trips going to locations outside of the MSA. Taken together, these two figures show the relative balance of trips to and from locations in and around the Salem MSA. While not shown in this study, it is important to note that the data set contains a number of additional variables that could be used to further refine the analysis.

Figure 7: JTW by Place of Residence for Selected Cities Near Salem



D. JTW Mode Shares to Portland's CBD and Lloyd District from Selected Corridors

- Urban Element (Part 3)

This study used the CTPP Urban Element, Part 3 tabulation to look at the mode share characteristics of work trips originating in the Division/Hawthorne bus corridor and the Banfield light rail transit corridor.

The two main corridors were delineated by inside/outside Interstate 205 in order to take into account differences in development intensity with information on flows to the CBD and the Lloyd District being sought. A map of the study area is presented in Figure 8. Results were calculated using blockgroup-level data which happened to be available for this particular study area.

Figure 8: Corridor Study Area

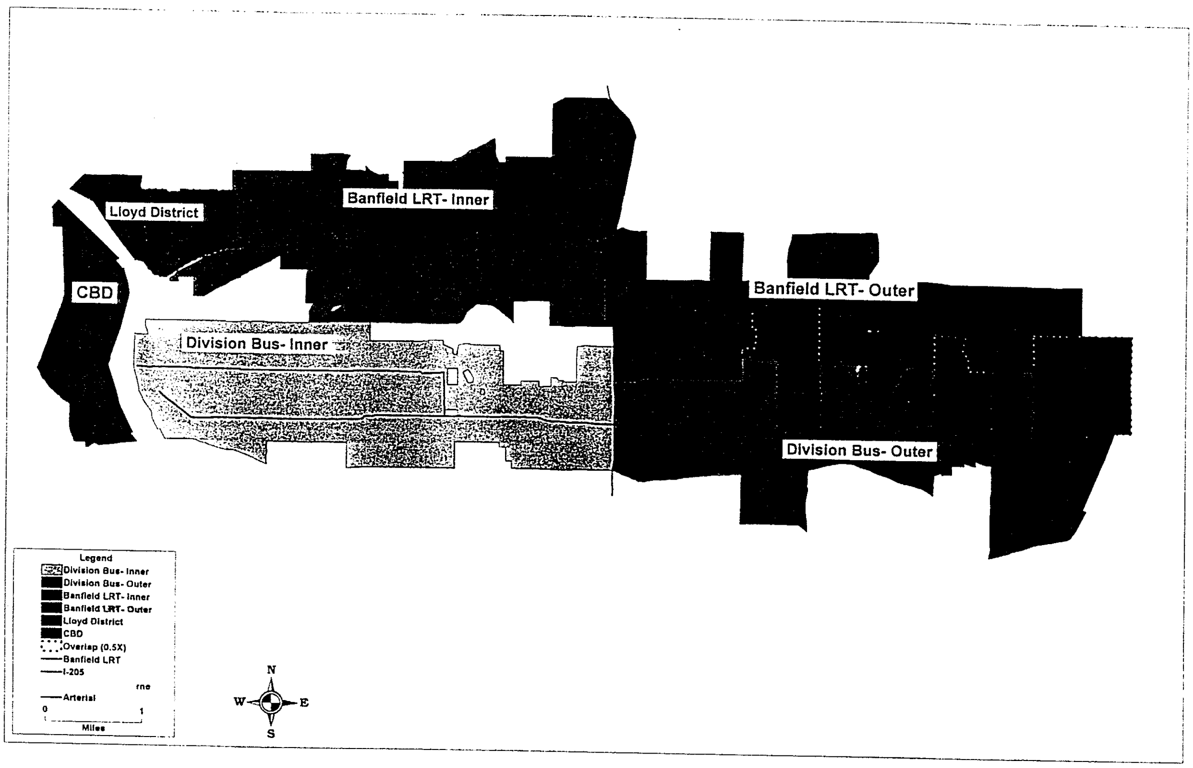
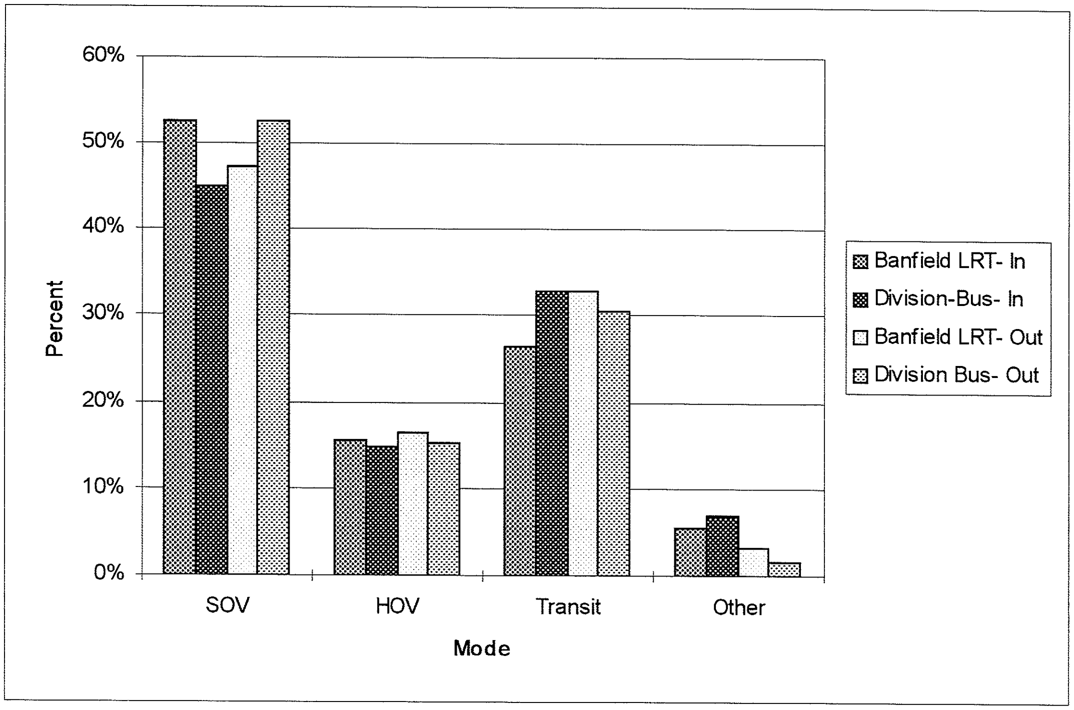


Figure 9 shows the mode shares attributable to each corridor to downtown Portland (CBD and Lloyd District taken together). Both the inner-Division corridor and the outer-Banfield corridor exhibit low SOV mode shares and high transit mode shares. The fact that the outer-Banfield corridor exhibits a higher transit mode share than the inner-Banfield corridor suggests that light rail is having a positive impact on suburban transit ridership. The data also show that carpooling mode shares are nearly the same for all four corridors. Table 3 shows the mode shares for each corridor segment to the CBD and the Lloyd District as separate destination areas (Table 3). The values shown in the table represent the percent contribution of each mode to a given corridor segment.

Figure 9: Mode Shares to Downtown Portland by Corridor



The most notable findings in Table 3 are a higher CBD transit mode share for the inner portion of the Division bus corridor compared to the Banfield light rail corridor and the higher Lloyd District transit mode share for the outer-Banfield corridor. The 17.5% mode share associated with "other" category for trips between the inner-Banfield corridor to the Lloyd District can be explained by factors relating to accessibility because of the fact that the two areas overlap considerably.

Table 3: Mode Shares to CBD and Lloyd District as % of Total Trips

Corridor	SOV	HOV	Transit	Other
CBD				
Banfield LRT- Inner	51.08	15.53	30.52	2.86
Division Bus- Inner	42.20	14.59	35.88	7.33
Banfield LRT- Outer	45.46	16.41	34.86	3.27
Division Bus- Outer	50.75	14.67	33.29	1.30
Total	47.40	15.25	33.17	4.18

Table 3: Continued

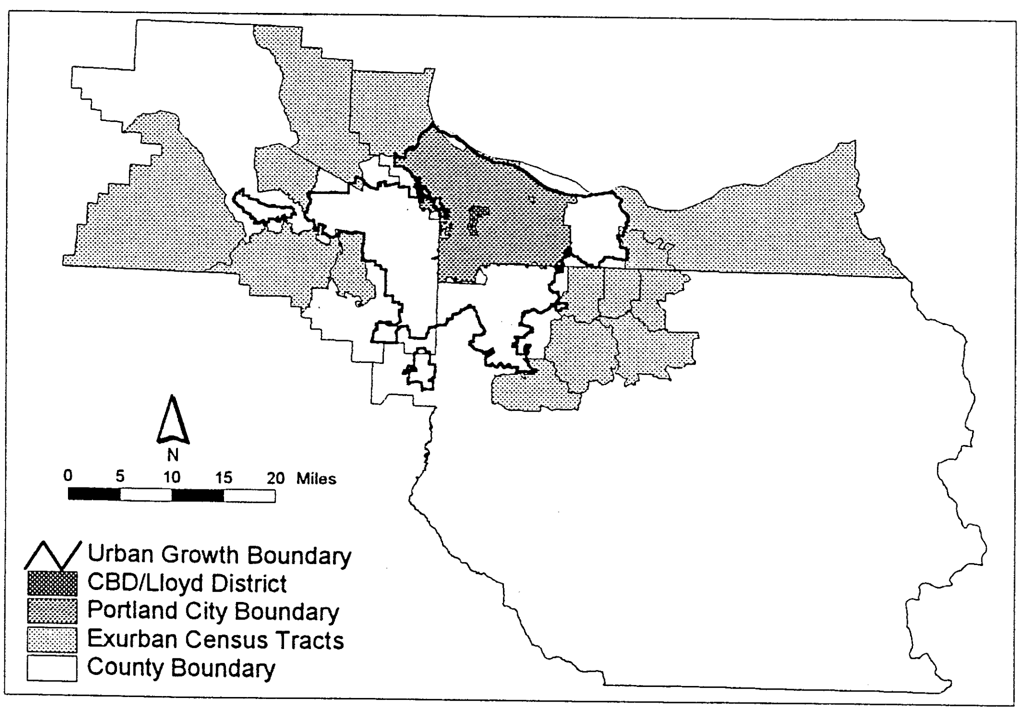
Corridor	SOV	HOV	Transit	Other
Lloyd District				
Banfield LRT- Inner	58.51	15.01	9.01	17.47
Division Bus- Inner	65.37	17.49	12.05	5.09
Banfield LRT- Outer	54.75	16.92	24.90	3.44
Division Bus- Outer	60.12	18.07	18.92	2.89
Total	59.49	16.41	13.48	10.63

E. Exurban Commute Characteristics to Selected Urban Area Destinations

- **Urban Element (Parts 1, 2 and 3)**

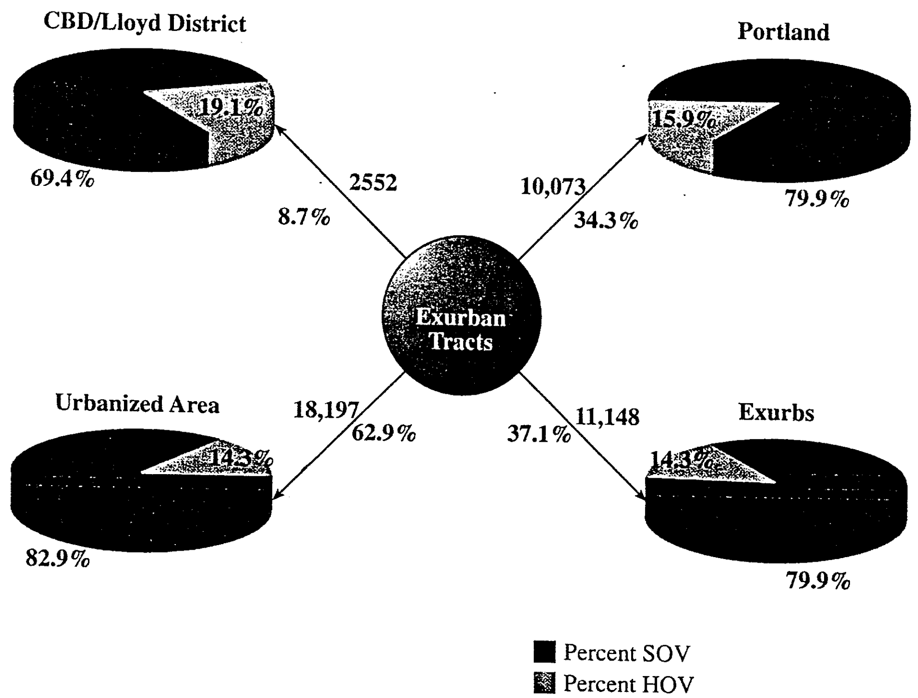
This study used all three parts of the CTPP urban element to look at the mode share characteristics of exurban commute flows to selected urban area destinations. In particular, the study was interested in determining the percent breakdown of SOV and HOV commuting. The exurban tracts that were selected for analysis were constrained to whole tracts lying outside of the urban growth boundary but within 0.5 miles of the same boundary. Fourteen tracts were ultimately selected for analysis, with all three metropolitan counties represented. Figure 10 shows the characteristics of the exurban study area.

Figure 10: Exurban Study Area Characteristics



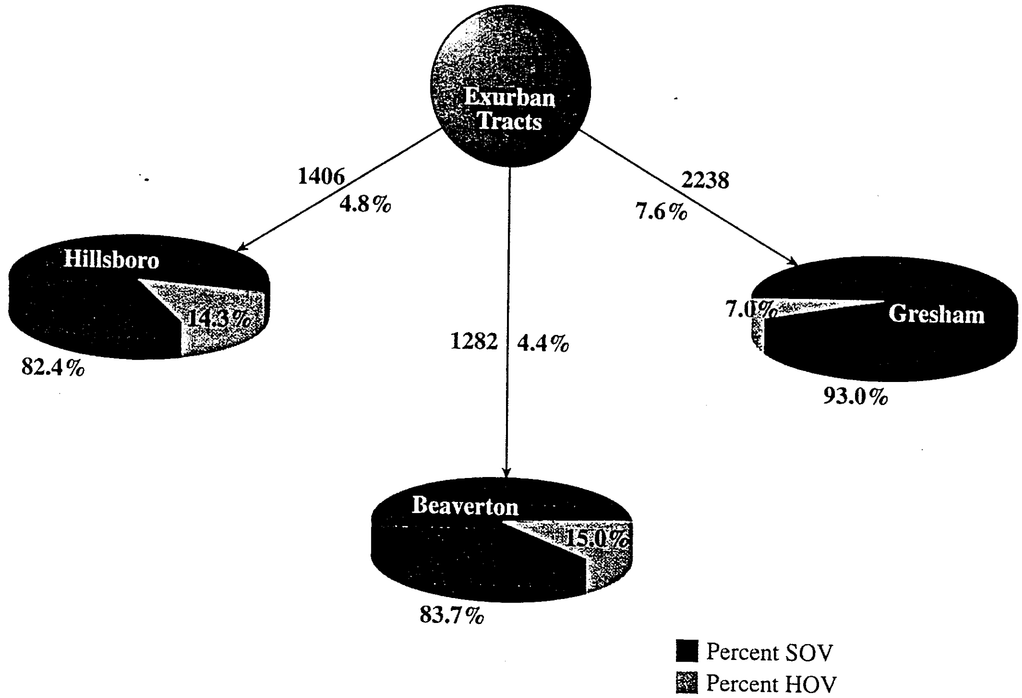
The first aspect of the study looked at the journey to work flows between the exurban tracts and various geographic areas within the metropolitan region. Figure 11 shows that 63% of the exurban work trips are to urban area destinations, while the other 37% are to locations within the exurbs themselves. Of the total number of exurban commute trips, roughly 34% are to the City of Portland, with only 9% going to downtown destinations. The highest carpooling mode share is associated with exurban residents commuting to downtown Portland.

Figure 11: Exurban Commuting Characteristics to Urban Area Destinations



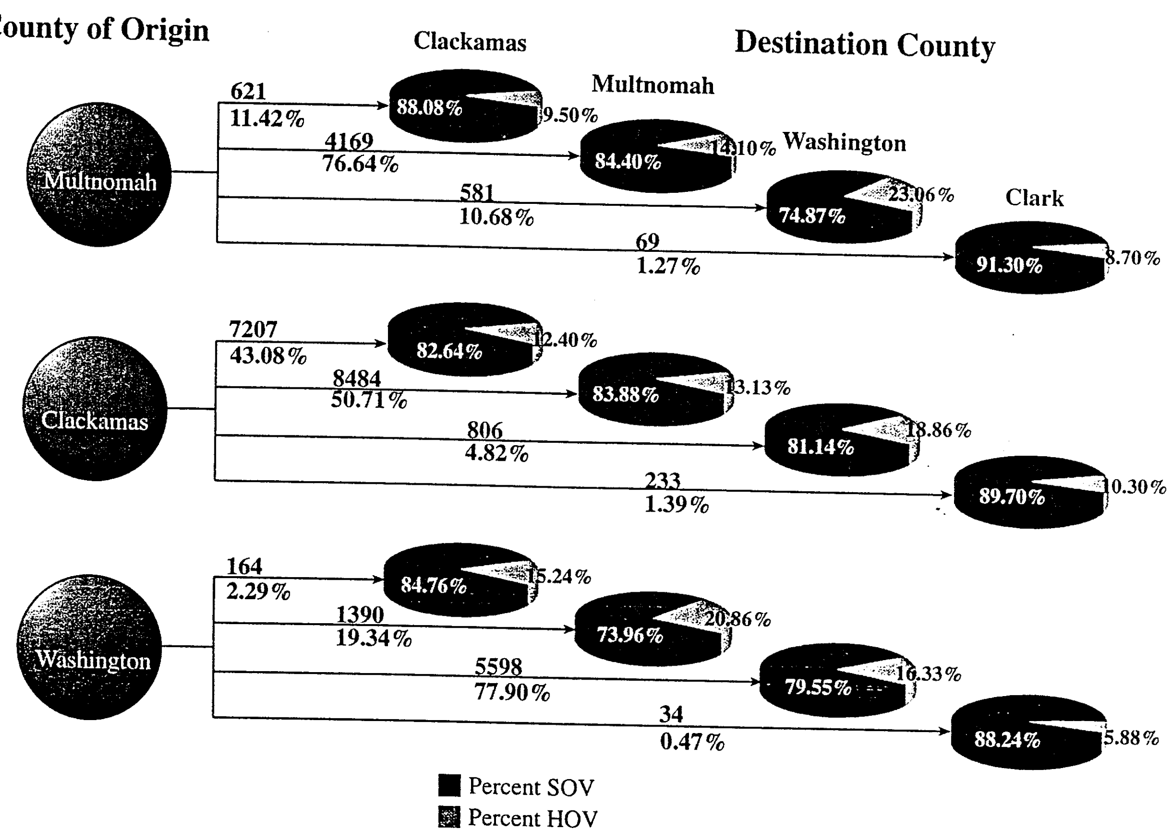
The second part of the study looked at the characteristics of exurban commute flows to selected employment destinations (Figure 12). Although Gresham shows the highest number of commute flows, Hillsboro and Beaverton have higher HOV mode shares. This last item suggests that greater levels of congestion or the concentration of employment destinations is more conducive to HOV commuting. Lastly, the analysis focused on the characteristics of exurban commuting by county of origin to county of destination. Figure 13 shows the breakdown of trips for each county.

Figure 12: Exurban Commuting Characteristics to Selected Employment Destinations



A number of interesting patterns emerge in the data. Approximately one-half of the exurban commute flows attributed to Clackamas County were to destinations in Multnomah County. In contrast, approximately three-quarters of Multnomah County trips were to Multnomah County destinations and three-quarters of Washington County trips were to Washington County destinations. The lower figure for Clackamas County trips to destinations within Clackamas County can be partially explained by a lack of employment opportunities found there. With regards to differences between SOV and HOV mode shares, the lowest HOV mode shares were for trips to Clark County, Washington which was included as a destination in this part of the analysis. The highest HOV mode share (21%) was for Washington County residents working in Multnomah County. The destination county exhibiting the highest HOV mode shares was Washington County. This is surprising because one would expect to see the highest HOV mode shares associated with Multnomah County destinations because that is where the CBD is located.

Figure 13: Exurban Commuting Characteristics by County of Origin to County of Destination



IV. Closing Remarks

The urban and statewide elements of the CTPP provide a wealth of information that can be used in a number of different types of transportation studies. Although data extraction proved to be cumbersome at times, potential users should not be discouraged from using the CTPP. The studies included in this report represent only a limited use of the data contained with CTPP. In addition to demographic and travel characteristics, the CTPP also contains extensive information on employment characteristics and travel times affecting the morning peak. Transportation planners should find the CTPP data useful for studies that require knowledge of aggregate flows between origins and destinations as well as the characteristics of those trips.

V. References

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