Effect of Auto Restraint Policies on Travel Behavior

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Auto restraint policies are becoming increasingly popular among urban planners and policy makers as a way of managing travel demand and traffic in city centers. Because urban access is considered crucial to the economic success of a downtown area, certain constituencies, such as business and retail, have historically been opposed to such policies. To address these concerns and design appropriate policies, it is important to understand how visitors to a city center are likely to respond to new policies. This paper presents a model for estimating the likely response to two potential auto restraint policies in the center of Tel Aviv, the largest metropolitan area in Israel: an increase in parking cost and the use of congestion pricing in the form of a cordon around the city center. The models are based on the responses of center visitors to a stated preference survey. The results show that for both workers and nonworkers, most drivers who respond to the policy will do so by changing their mode of travel, and, in the case of congestion pricing, by also changing the time of their trip. The minority will respond by changing their destination or canceling their trip. This is an encouraging result from a policy point of view because changing time or mode is considered a positive shift, whereas changing destination or canceling the trip is considered negative. The results indicate that auto restraint policies can be effective in reducing traffic congestion and air pollution in city centers without hampering their economic vitality.

Auto restraint policies are becoming increasingly popular among urban planners and policy makers as a way of managing travel demand and traffic in city centers. In many countries, governments are increasingly using such policies as a means of reducing urban road traffic (*1–5*). Many researchers believe that congestion pricing and parking measures are effective means of reducing congestion (*1, 6, 7*).

To date neither congestion pricing nor parking pricing has been applied in Israel, but various pilot policies in this direction are now being considered. Given the political fragility of auto restraint policies and the lack of evidence regarding their potential effects in Israel, there is a need for research into this topic. The purpose of this paper is to study the potential response of city center–bound travelers to congestion pricing and parking pricing through a response model based on stated preference data. This research will help clarify the role of auto restraint policies in developing sustainable transportation programs.

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BACKGROUND

Auto Restraint Policies as Travel Demand Management Strategy

City center travel can be managed through several types of policy interventions. Congestion pricing can be implemented on a facility basis or by employing a cordon around the city center, as has been done in London. There are various type of parking measures, including controls on the number of parking spaces, their spatial distribution, parking costs, parking time limits, residential parking permits, taxes, provision of employee parking, and levels of policy enforcement. The total amount of parking available in the city center can affect the amount of traffic entering the area, and the location and layout of these spaces can affect the movement of traffic within the center. Parking programs, however, do not typically affect through-traffic. Such programs may even increase both through-traffic and the number of chauffeur-driven cars. Congestion pricing is a more effective way of reducing all types of trips.

Auto restraint policies can be used to encourage people to shift from private cars to public transportation. Such policies, however, can have other effects on travel patterns. They may encourage people to travel to other destinations, change the time of day of their trip, or change or cancel their activities. In the long run, the policies may even cause businesses to move outside of the existing business district, thereby dispersing activities and increasing dependency on private vehicles. Such a response may increase congestion and air pollution in the long term and thus reverse the effects intended in implementing the measure.

The objective of auto restraint policies should be to increase the attractiveness of the central business district (CBD) as much as possible by encouraging people to change their choice of travel mode and travel time without discouraging them from coming to the city center. A successful policy should restrain commuting by car without hindering shoppers and people doing personal business. Commuters can shift only their travel mode and occasionally the time of day of their trip, but shoppers and other visitors can shift their destination or even cancel their trip altogether, thus affecting the economics of the city center.

The benefits and costs of auto restraint policies should be carefully studied before policies are implemented. Benefits include reduced travel time and costs for some users; improved downtown amenities and potentially improved economic activity; reduced air pollution, noise pollution, and energy consumption; more productive land use in the case of reducing parking availability; and a reduced need to expand highways. Costs include a potential decline in economic activity, an increase in administrative costs, larger transit deficits, higher travel time and operating costs for users who change their travel patterns to avoid the restraint penalty, and potentially increased congestion outside the area where the measure is applied. Finally, revenue from such policies should be considered neither a benefit nor a cost, but rather a transfer of resources.

To evaluate the potential benefits of auto restraint policies and to learn how they function as a powerful transportation-planning tool, we need an improved understanding of individuals' responses to them and how those responses in turn affect traffic congestion, land use, and the vitality and value of the CBD. The need to study the effect of auto restraint policies is magnified given the traditional opposition to such measures from state and local officials, business interests, and the general public (*8*). For a long time it has been an article of faith that "when it comes to parking, more is better," and that drivers should not be charged to enter cities. This position is especially strong among downtown retailing communities who view parking restrictions and congestion pricing as a threat to their business (*9*). In a recent survey of CBD retailers in Philadelphia, 36 out of 98 respondents suggested that improving parking would be the most important change that could help their business (*3*). In a recent survey conducted by the author in Haifa, it was found that parking is the second most important factor in location decision making for businesses, second only to rent.

Studying Effect of Auto Restraint Policies

Limited data and information, however, are available on the potential impact of parking measures and congestion pricing on individuals' travel behavior patterns and on the long-term effects of such measures. The few existing studies are either empirical studies that examine the before-and-after implementation of such policies, or simulation studies, in which travel demand models are used to evaluate the potential effect of the policy by changing the auto cost value in the model.

Examples of empirical studies include Thomson (*10*), U.S. Department of Transportation (*9*), Mehranian et al. (*11*), Surber et al. (*12*), Willson (*13*), Willson and Shoup (*14*), and Shoup and Willson (*15*). The advantage of these studies is that they look at actual changes in travel patterns resulting from the implementation of such policies. However, they have two main problems: first, it is difficult to isolate the effect of the auto restraint measures from other external effects and second, it is difficult to identify the trips that are most affected. Identifying the affected trips is very important in gauging the outcome of the policy. As noted earlier, if most of the trips affected are work trips, then the measure is very successful; however, if most are shopping or other visitors' trips, then the measure may have a negative effect. Examples of modeling and simulation modeling studies include Gillen (*16*) and Gomez-Ibanez and Fauth (*17*). The main problem of the modeling and simulation studies is their reliability. The ability of the model to correctly predict the response to auto restraint measures is questionable, especially because these models have not usually been calibrated for such purposes but have been developed mainly for the evaluation of new infrastructure.

METHODOLOGY

Given the problems of the simulation studies and the lack of before-and-after data regarding auto restraint policies in Israel, it was decided to estimate a response model based on stated preference data. The problems of stated preference data and models are well recognized [see, for example, Beaton et al. (*18*) and Bates (*19*)]. However, given the lack of revealed preference data, the stated preference approach was chosen. The purpose of the model is not to provide accurate estimates of changes in travel behavior as the result of a specific policy, but to get an initial indication of the likely behavioral changes of travelers under such policies and thereby better understand their implications for the development of sustainable transportation. There are two major advantages to the response model:

- It can model different types of responses, not merely mode shifts.
- It can differentiate between workers and nonworkers. As explained above, understanding who is affected is important for the analysis of the cost and benefits of the policy.

A stated preference survey of 294 car drivers arriving at the Tel Aviv city center was conducted to study their response to congestion pricing and changes in parking pricing. Tel Aviv is the largest metropolitan area in Israel and is the country's main financial and cultural center. The Tel Aviv Metropolitan Area (TAMA) stretches over 1,475 square kilometers and is inhabited by 2.6 million people, of which 90% live in urban areas. In 2000 it produced 50% of the country's gross domestic product and was responsible for 46% of the jobs. It is a transportation focal point for all traffic between the north and the south of Israel, as well as for the interconnecting traffic between the main cities (Jerusalem, Tel Aviv, Haifa, and Beer Sheba). TAMA has about 5,800 lane kilometers of roads, of which 11% are divided highways. The public transport system is based mostly on buses, which serve 96% of the transit trips. There are about 350 cars per 1,000 inhabitants, higher than the national level of about 280 cars per 1,000 inhabitants. Mode split between private and public transportation is about 70:30 in favor of the private car. About 38,000 vehicles per hour enter the CBD during the morning peak hours.

The survey focused on automobile drivers, who were asked a series of questions about the trip they had just made, including origin, arrival time, trip purpose, the time needed to find parking and to walk from the parking location to the destination, and the type of parking (paid versus free; on versus off street). The stated preference part of the survey included experiments asking drivers for their potential response to (*a*) a cordon congestion pricing scheme with charges varying up to 20 new Israeli shekels (NIS) per entrance between 6:30 and 9:30 a.m., and (*b*) a surcharge parking fee of up to 20 NIS. At the time of the survey, 4 NIS were equal to about US$1.

The question was asked as follows: If such a congestion pricing or parking surcharge were in effect today, what would you have done for the trip you just completed? The drivers were asked to assume that driving conditions would be the same as today under these different scenarios. For each question, respondents were asked to choose one of seven potential responses:

- Continue to arrive by car, without a change in their behavior;
- Shift to public transportation;
- Shift to taxi;
- Shift to walk;
- Cancel the trip;
- Change destination; or
- Change time of day.

Each of the 294 respondents was asked to respond to four different choice experiments: two regarding congestion pricing and two regarding parking pricing. Their responses provided a database of 588 observations for model estimation for each policy. Finally, the survey contained some demographic and socioeconomic questions regarding age, marital status, household size, children, auto ownership, number of drivers, and income.

The survey data were used to estimate the response model. The model is specified as a multinomial logit (MNL) model where the utility of each alternative response is specified as

$$U_i = V_i + \epsilon_i$$

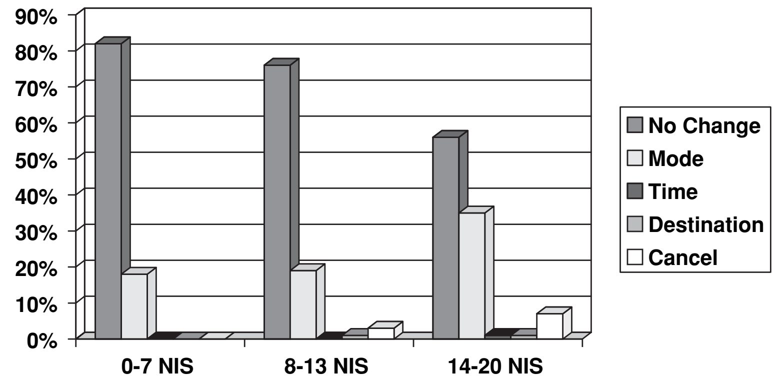

FIGURE 1 Response of workers to parking surcharge.

where

U_i = utility of alternative response i for a given traveler;
V_i = systematic component; and
ϵ_i = random component.

The systematic component of the utility can be written as

$$V_i = \beta' X_i$$

where X_i is a vector of attributes for alternative i, with some of them interacting with traveler characteristics, and β is a vector of coefficients. In the MNL model, ϵ_i is Gumbel distributed, independently and identically across alternatives, and the probability that alternative i will be chosen is

$$p(i) = \frac{\exp(\mu V_i)}{\sum_{i \in L} \exp(\mu V_i)}$$

where μ is the scale parameter, and L is the set of available alternatives.

SAMPLE

The sample was comprised of 59% work trips and 41% nonwork trips. Most nonwork trips were errand trips (31% of all trips), and the rest were rouhly equally divided into shopping trips, entertainment trips, and other trips. Of the drivers, 78% drove alone, 18% had one passenger, and 4% had at least two passengers.

Altogether, 67% of the respondents paid for parking; this share is about the same for work trips and nonwork trips. Among those who paid for parking, 69% parked on the curbside, and the rest in parking lots. Among those who parked for free, 35% parked on the curbside, and 65% parked in illegal parking locations. Of all respondents, 58% spent less than 5 min searching for parking, and another 13% spent between 5 and 10 min searching for parking. Of the respondents, 84% walked for less than 5 min from their parking place to their destination, 12% walked between 5 and 10 min, and the remaining 4% walked for more than 10 min.

SOME RESULTS

This section presents some of the survey results that indicate the respondents' tendency to change their behavior in response to the two policies. The focus of this paper is on the response model that will be described in the next section.

Figure 1 shows the response of workers to an increase in parking price; Figure 2 shows this response for nonworkers. The most significant behavioral change for both workers and nonworkers is in mode choice, with very little shift in time of day and some shift in destination and trip cancellation. As expected, for work trips, there is almost no change in destination, but the level of trip cancellation is similar to that for nonwork trips. Such cancellation can be a result of avoiding trips during the day, for instance, during a lunch break, and shows up as an eliminated trip to work. These results are different from those found in the survey conducted by Shiftan (*20*) in the city of Haifa, which showed a much more significant difference between work and nonwork trips. Figure 3 shows the response of workers to congestion pricing, and Figure 4 shows this response for nonworkers. The dominant behavioral change here is in time of day, followed by mode shift. There is a small change in destination, and there is some trip can-

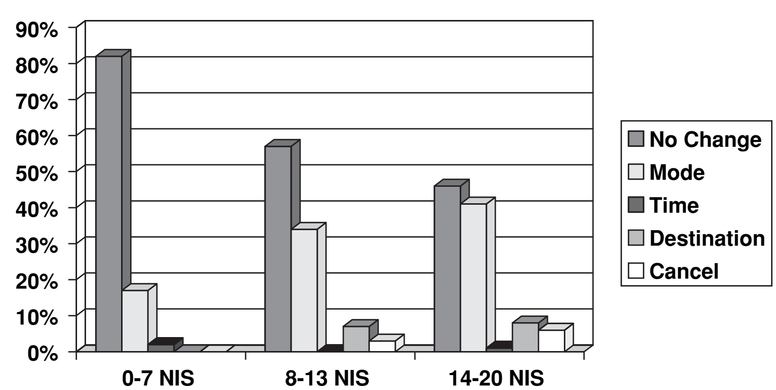

FIGURE 2 Response of nonworkers to parking surcharge.

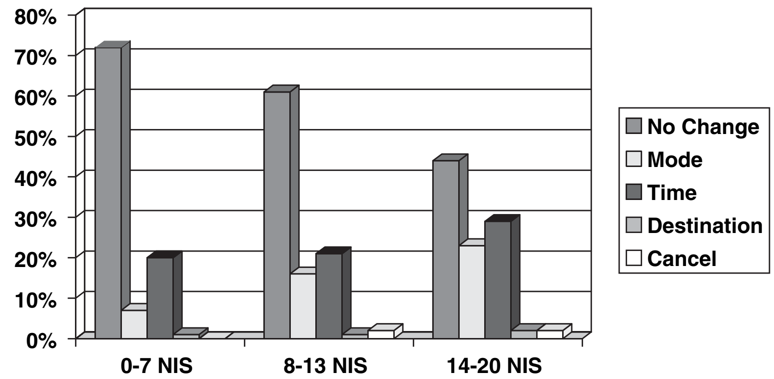

FIGURE 3 Response of workers to congestion pricing.

cellation. Although there are more trip cancellations for nonworkers, as expected, the difference is not significant. As expected, the most notable difference between the parking pricing policy and the congestion pricing policy is the significant shift in time of day for the congestion pricing. The availability of the time-of-day shift option in the congestion pricing policy induces an overall higher shift in behavior compared to similar prices in the parking policy, where this alternative is not available. In this respect, the congestion pricing policy is more effective in providing more alternatives and in reducing peak-hour congestion. The parking policy is more effective in increasing transit share. Obviously, the parking policy also could be administered only at peak hours, and it would be interesting to test whether there would be a difference in response to those two policies if their pricing implications were similar.

A good auto restraint policy should encourage center city visitors to shift mode and time of day, but not discourage them from coming to the center. Changes in mode or time of day are considered positive because they will reduce traffic without reducing the number of visitors to the center. Changes in destination or trip cancellations, although helping to reduce congestion, will also reduce the number of visitors to the center and may affect its vitality; these changes are therefore considered negative. The results from this survey indicate that most of the changes made in response to the policies, by both workers and nonworkers, are positive. Again, these results are significantly different from those found in Haifa (*20*), where for nonworkers there was a significant share of destination changes and trip cancellations. In the Haifa study, for the whole sample, there was only a 5% difference between those who state that they would change mode or time and among those who state that they would change their destination or cancel their trip. The Haifa results suggest that the policy can be a good one for work trips but is questionable for nonwork travelers, who were far more likely to respond undesirably to parking restrictions by shifting their activity to other centers. Such a travel-behavior response by shoppers and other visitors can have a significant effect on the vitality of the center and eventually may cause businesses to leave the center. In the long run, commuters to these businesses may also shift destination as a result of the policy. This problem is not shown in the current study. One of the reasons for the different results may be that the Tel Aviv city center is a much stronger center; it is the main business center for all of Israel, whereas the Haifa Carmel Center is a relatively small center and is only one of several centers in the city of Haifa. Therefore, Tel Aviv's attractiveness is stronger, and an auto restraint policy can be more efficient.

MODEL ESTIMATION RESULTS

Two models were estimated for the probability that a driver to the Tel Aviv city center will change his travel habits: one as a response to congestion pricing, and the other as a response to parking surcharge. These models estimate the probability that the visitor will choose one of six alternatives as a response to one of the auto restraint policies:

1. Make no change in behavior,
2. Shift mode to public transportation or walk,
3. Take a taxi,
4. Shift time of day,
5. Change destination, or
6. Cancel the trip.

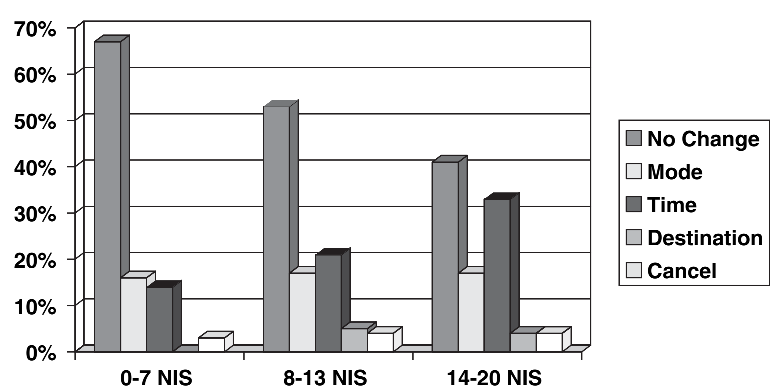

FIGURE 4 Response of nonworkers to congestion pricing.

In these models all of the coefficients except the alternative constants were constrained to be equal among Alternatives 2, 3, and 4 (change time or mode) and among Alternatives 5 and 6 (change destination or cancel the activity). This was done to test for differences in response behavior between these two groups of responses, the first considered positive, and the second considered negative. Although the data were not sufficient to support full model segmentation by trip purpose, partial segmentation was performed for the policy variable cost and for income. The policy variable was segmented by trip purpose to test the effect on commuters versus other types of visitors.

Table 1 shows the results of these two models. The utility of not changing travel behavior is defined as zero. Each cell shows the estimated coefficient: One star indicates that the coefficient is significantly different from zero at the 5% significance level, and two stars indicate a 1% significance level. The different variables and the results of their coefficients' estimates are discussed below. In this discussion the term "significant" refers to the coefficient being significantly different from zero at a 5% confidence level.

Cost

This is the policy variable in the models, having highly significant positive coefficients in both models, for both alternatives and for both workers and nonworkers. This variable shows, as expected, that increasing parking cost or introducing congestion pricing will cause people to change their travel behavior. This coefficient is always higher for nonworkers than for workers; this shows that nonworkers are more likely to change their travel behavior in response to restraint policies. These results make sense, because nonworkers are more flexible; however, none of these differences was significant. The coefficient for changing mode–time alternative is higher for the congestion pricing policy, while the coefficient for the destination–cancellation is higher for the parking pricing policy. As discussed previously, the result of the mode–time alternative can be explained by both the mode and time options that are available in response to congestion pricing, whereas only mode change is a reasonable option in the parking pricing alternative. The only significant difference among these eight coefficients is between the mode–time coefficients as compared to the destination–cancellation coefficients in both models for workers, and in the congestion model also for nonworkers. In these cases the mode–time coefficients are always higher than the destination–cancellation coefficients. This is an encouraging result because changing time or mode is considered positive, whereas changing destination or canceling the trip is considered negative.

Income

Income has a negative coefficient that is significant only for the mode/time alternative. This shows that people with higher income are less likely to change their mode or time of day. This makes sense because higher-income people have a higher willingness to pay. This coefficient is higher for the parking model than for the congestion pricing model. This may be explained by higher-income individuals' having more flexible schedules and a greater ability to change time of day and therefore being more likely to respond to congestion pricing than to parking pricing. Finally, the income effect is stronger for workers than for nonworkers, as expected. Although all of these differences make sense, none was significant. Nonetheless, it is interesting to see these differences, it was decided to keep them in the model.

Missing Income

This is a dummy variable that equals one if income is missing (usually because the respondent refused to answer this question) and zero otherwise. The coefficient has a significant negative value showing that missing income behaves similarly to high income. This result is expected because higher-earning people are usually the ones who refuse to answer the question about income.

Household Size

This coefficient is positive and significant for the parking model, showing that larger households are more likely to change their travel

TABLE 1 Model Estimation Results

	Congestion		Parking	
Variable	Mode–Time	Destination–Cancellation	Mode–Time	Destination–Cancellation
Cancel		−0.98*		−2.32*
Destination		−1.06*		−2.04*
Time	−1.85*		−2.11*	
Transit	−1.23*		−2.64*	
Taxi	−1.04*		−1.67*	
Cost work	0.105**	0.065*	0.087**	0.079**
Cost nonwork	0.121**	0.085*	0.092**	0.093*
Income work	−0.230**		−0.487**	
Income nonwork	−0.186**		−0.432**	
Missing income	−1.214*		−2.486**	
Household size			0.11*	0.09*
Payforpark	−0.561**	−0.683*	−0.356*	−0.456**
Time diff	−0.072*		−0.096*	
Transfers	−0.210*		−0.173*	
Young	0.46*		0.25*	
Initial likelihood	−645.98		−645.98	
Final likelihood	−462.43		−404.68	

* = significant at 5% level.
** = significant at 18% level.

behavior. This coefficient may be a proxy for income per person or for the competition for the car need. This variable was not significant for the congestion pricing model.

Transfers

Transfers refer to the number of transfers the visitor must take to arrive at the center by public transportation. This variable has a negative and significant coefficient, indicating that the more transfers the person must make if he or she comes to the center by public transportation, the less likely he or she is to change mode in response to auto restraint policies.

Time Diff

Time diff is the difference in door-to-door travel time between the public transportation alternative and the car alternative. This coefficient is negative and significant in both models. The higher the additional travel time in public transportation compared to travel time in a car, the less likely the respondent is to change his travel mode.

Payforpark

Payforpark is a dummy variable that equals one if the driver actually paid for his parking and zero otherwise. This variable has a significant negative value in both models and for both alternatives, showing that those who are already paying for parking are less likely to change their behavior as a result of new charges. This result is expected because those who are already paying for parking have a higher willingness to pay and most likely a higher need for coming to the center with their car. Furthermore, they are less likely to change destination or cancel their trip than to change the trip's time of day or mode. This result is expected because the people already paying for parking are the travelers who are less flexible and therefore less likely to change their destination or cancel their activity.

Young

Young is a dummy variable that equals one if the respondent is under 40. This variable has a significant positive coefficient for the alternatives of changing mode or time of day in both models but was not significant for the alternative of changing destination or canceling the activity. This means that young visitors to the center are more likely to change their mode or time of day in response to auto restraint policies. This finding suggests that auto restraint policies can be more effective in influencing young people to change mode or time of day and not change their destination or cancel their trips. This variable may be a proxy for income level and may also suggest that younger people are more flexible and willing to make changes.

Value of Time

The value of time derived from the model is calculated as the ratio of the marginal utility of time and the marginal utility of cost. The value of time derived from the congestion-pricing model is 41 NIS/h for workers and 36 NIS/h for nonworkers. The value of time for the parking pricing model is 66 NIS/h for workers and 63 NIS/h for nonworkers. These values are somewhat higher than the average wage rate per hour in Israel, which is about 25 NIS/h.

Different nested model structures were tested, but none of them was found to add significant explanatory power to the model. Nested structure I (Figure 5*a*) is consistent with the assumption of a hierarchical choice process in which people first consider whether to change time or mode, change destination or cancel the trip, or not to change their behavior. Following this decision the visitor must decide about the specific change within a group of alternatives (i.e., change time or mode within this group, or change destination or cancel the trip within that group). Nested structure II (Figure 5*b*) is consistent with a hierarchical choice process in which the person first decides whether to change behavior. If he or she decides to change behavior, then he or she must select the specific change from a list of alternatives. Finally, nested structure III (Figure 5*c*) is consistent with a hierarchical choice process in which the person must first choose whether to change behavior. If he or she decides to change behavior, then he or she must select a group of change alternatives and only then can pick a specific change from the group of alternatives selected.

MODEL APPLICATION

The estimated model was used together with the regional transportation model and various data sources to estimate the potential change in auto trips to the city center in response to various auto restraint policies. The overall application procedure is shown in Figure 6. Work and nonwork auto trips for the morning peak hour were taken from the regional origin–destination auto matrices at the zone-to-zone level. Trips were segmented by income level and age based on data from the census regarding these variables at the origin zone. Furthermore, the data from this survey were used to estimate commute cost reimbursement by income level, and this information was used to further segment the population by those who are reimbursed for their commute trip cost and those who are not. Level-of-service variables for auto and public transportation were taken from the regional transportation network. The time difference between car and public transportation was calculated, and the number of transfers was calculated for each origin–destination pair. These variables were fed into the application program, and, assuming various parking and congestion costs, new auto trip tables were calculated for the peak hour. These results are presented in Figure 7. It should be indicated that no equilibrium was achieved, so this should be considered an upper limit to the percentage change, because time difference will be less once some auto trips are eliminated from the road at peak hours. It is also important to remember that these estimates are based only on the stated preference models and are not calibrated to any revealed preference data; they should therefore be considered only as trend changes, not considered in their absolute values. However, they are important in showing the potential effects of such policies; they basically reflect the model estimation results and emphasize them. The higher the charge, the more drivers will change their behavior. The percentage change for nonworkers is similar for both policies, but workers are less likely to change their behavior in response to the parking policy than they are in response to congestion pricing.

CONCLUSIONS

In this study, a response model was used to estimate the response to different parking policies based on stated preference data. Although the use of stated-preference data may include some bias, and the resulting behavioral change of up to 12% should be treated with caution, this approach enabled the modeling of different types of responses, not merely mode shift, and permitted the differentiation of workers and nonworkers. These two features provide a very important advantage in analyzing the implications of such policies for the vitality of city centers.

The results of the model show that for both workers and nonworkers, most drivers who respond to the policy will do so by chang-

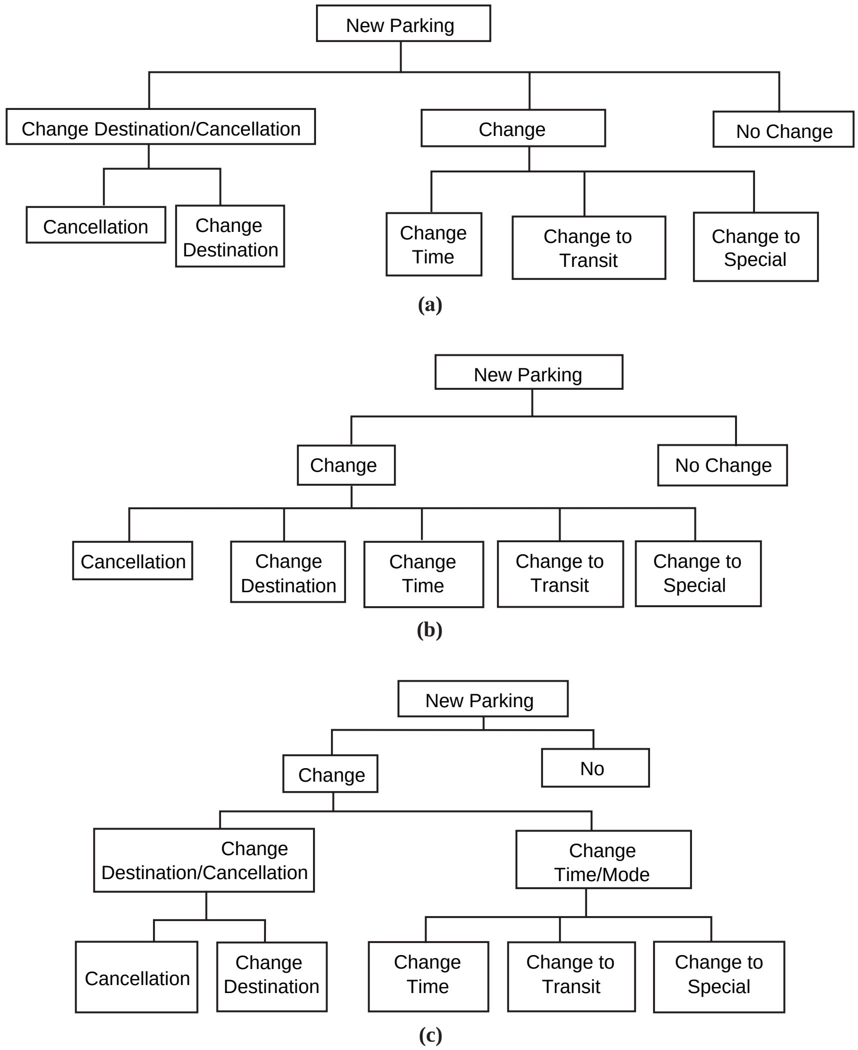

FIGURE 5 Nested logit model structures: (*a*) Structure I, (*b*) Structure II, and (*c*) Structure III.

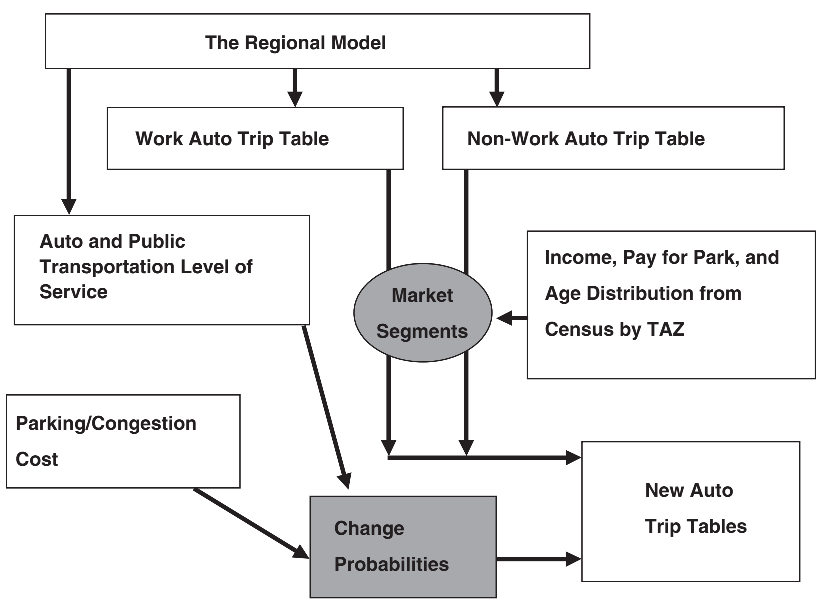

FIGURE 6 Application procedure.

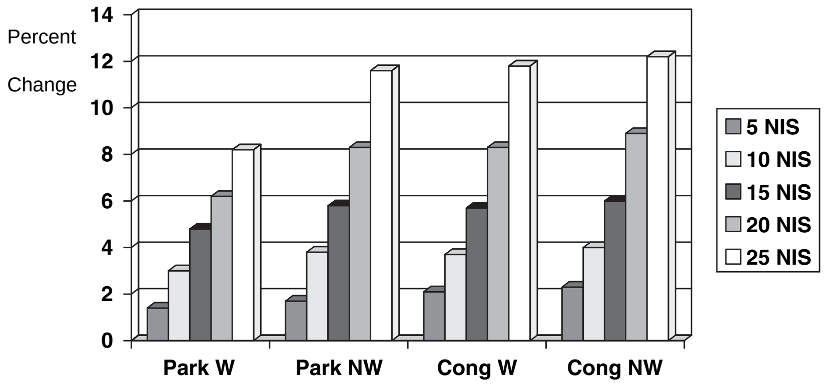

FIGURE 7 Model application results (Park = parking, W = work, NW = nonwork, Cong = congestion).

ing mode of travel, and, in the case of congestion pricing, also by changing the time of their trip. The minority will respond by changing their destination or canceling their trip, with no significant differences between workers and nonworkers. This is an encouraging result from a policy point of view, because changing time or mode is considered a positive shift, whereas changing destination or canceling the trip are considered negative. If these results are trusted, they indicate that auto restraint policies such as the ones examined here may be very effective in reducing congestion and improving air quality without hampering the economic vitality of the city center. However, it should be noted that these results are significantly different from those found in the Haifa study. The same type of results were obtained in Haifa for the parking pricing policy for workers. However, for nonworkers, the Haifa results showed that workers are likely to make both types of changes (mode–time changes and destination–cancellation changes) at a similar level. If these results are accurate, they imply that such policies may have a negative effect on the vitality of the business district because shoppers and other visitors are likely to respond to the change by going elsewhere. The effect of restraint policies on regional travel patterns and air quality in this case is not clear. These various results also show that the implications of auto restraint policies are regional and context specific. The Carmel Center in Haifa is only one of a few centers in the city, whereas the Tel Aviv center is an exclusive regional destination that serves as the nation's main business and cultural center; the difference between the two locations is reflected in the differences in travel behavior. From this limited sample, it may be concluded that in most cities where there are various alternatives, the Haifa case is more typical, whereas in cities that serve as special and unique centers, the Tel Aviv case is more typical, and auto restraint strategies may be more effective. However, the potential results of the application of auto restraint policies should be carefully studied before implementation at a specific location. Further research and more detailed local studies are required before such measures can be implemented. The relationships and effectiveness of such policies with improved transit service and land use variables should be carefully studied. In addition, the modeling response to auto restraint policies can be improved by combining stated and revealed preference data.

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