

Table 1. Applications of MDCEV based frameworks in the literature

Authors	Application Focus	Data Source	Discrete alternatives		Continuous component	Model Type
			# of alternatives	Alternative labels		
Bhat (2005)	Activity time-use: Analyze time-use allocation decisions among a variety of discretionary activities on weekends	2000 San Francisco Bay Area Travel Survey	Five activity purposes	(1) In-home social, (2) In-home recreational, (3) Out-of-home social, and (4) Out-of-home recreational and (5) Out-of-home non-maintenance shopping	Total time spent in the activities considered	Mixed MDCEV
Bhat <i>et al.</i> , (2006)	Activity time-use: Modeling individual time-use in maintenance and leisure activities as a function of demographic variables, urban environment attributes, and day of week/season effects.	2000 San Francisco Bay Area Travel Survey	Ten category activity classification	(1) Maintenance, (2) In-home relaxation, (3) In-home recreation, (4) Non-work internet use, (5) Social, (6) Out-of-home meals, (7) Out-of-home non-maintenance shopping, (8) Out-of-home volunteer, (9) Out-of-home recreation, and (10) Pure recreation	Total time spent by the individual in the ten activities	Error components MDCEV - MNL
Copperman and Bhat (2007)	Children activity time-use: examines the out-of-home, weekend, time-use patterns of children aged 5 through 17 years, with a specific emphasis on their physical activity participation	2000 San Francisco Bay Area Travel Survey	Four activity types	(1) Passive activity, (2) Passive travel. (3) Utilitarian active travel, and (4) Recreation active activity and travel	Total time spent by the child in the four activity purposes	MDCEV-Binary Logit
Kapur and Bhat (2007)	Activity time-use: Analyzing adult weekend time-use participation, in maintenance and discretionary activities, with a specific emphasis on “with whom” dimension of the participations.	2004 American Time Use Survey	Twenty one - (joint categories of five out of home activities and four companion type + one in-home discretionary activity)	In-home discretionary activity, Out of Activity types: (1) Social, (2) Relaxing, (3) Arts and events, (4) Sports, and (5) Active recreation Companion types: (1) “Alone”, (2) Family (3) Friends (4) Family and Friends	Total time spent in the twenty activities	Mixed MDCEV
Sener and Bhat (2007)	Children activity time-use: examines the discretionary time-use of children by focusing on the accompanying individuals in children’s activity engagement	2002 Child Development Supplement (CDS) to the U.S. Panel Study Income Dynamics (PSID)	Thirty one (In-home leisure + 5 out-of home leisure activities disaggregated into 6 companion types)	1)In-home leisure Out-of-home activities (1) shopping, (2) social, (3) meals, (4) passive recreation, and (5) active recreation Companion type: (1) alone, (2) mother only, (3) father only, (4) with both mother and father, and no one else, (5) with other individuals, but no parents, and (6) with other individuals and one or both parents	Total time invested in activity engagement.	MDCEV

Authors	Application Focus	Data Source	Discrete alternatives		Continuous component	Model Type
			# of alternatives	Alternative labels		
Sener <i>et al.</i> , (2008)	Activity time-use: Analyzing discretionary leisure activity engagement of children	2002 US Child Development Supplement of the Panel Study of Income Dynamics	Twelve activity type categories	The twelve alternatives are based on 1) activity type (physically active or physically passive), 2) nature (structured or unstructured), 3) day of week (weekday or weekend) and 4) location (in home or out of home) Ex: Weekend Passive Unstructured Activity in home	Total time available for children to participate in discretionary activity pursuits	Mixed MDCEV
Pinjari <i>et al.</i> , (2009)	Self-selection bias in activity time-use: presents a joint model system to examine the influence of residential location on activity time-use	2000 San Francisco Bay Area Travel Survey for Alameda County	Thirteen category activity purpose classification	(1) Maintenance (2) In-home (IH) internet browsing, (3) Out-of-home (OH) volunteering (4) OH non-maintenance shopping, (5) IH socializing, (6) OH socializing, (7) IH relaxing, (8) IH recreation, (9) OH meals, (10) OH physically active pure recreation, (11) OH physically inactive pure recreation, (12) OH physically active recreation, and (13) OH physically passive recreation.	Total time spent by the individual in the thirteen activities	Joint Multinomial Logit (MNL) - MDCEV MNL for residential location and MDCEV for activity time-use
Spissu <i>et al.</i> , (2009)	Activity time use: Models weekly activity-travel behavior with emphasis on understanding inter-personal and intra-personal variability	Twelve Week Leisure Travel Survey administered in the Zurich region	Six activity purposes	(1) Social, (2) Meals, (3) Sports, (4) Cultural, (5) Leisure and (6) Personal business	Total weekly time spent in the activities considered	Panel Mixed MDCEV
Pinjari and Bhat (2009)	Activity time-use: Analyze non-worker out of home discretionary activity time-use and activity timing decisions on weekdays	2000 San Francisco Bay Area Travel Survey	Thirty two (two in-home activity purposes, five out-of-home activity purposes disaggregated into six time periods)	Activity purposes: (1) In-home (IH) and out-of home (OH) maintenance, (2) IH discretionary/leisure, (3) OH volunteering, (4) OH socializing, (5) OH recreation, (6) OH meals, and (7) OH non-maintenance shopping. Activities 3-7 are further disaggregated for the following time periods: (1) Early morning (3am-7am), (2) Morning (7am-9am), (3) Late morning (9am-12 pm), (4) Afternoon (12 pm-4pm), (5) Evening (4pm-7pm), and (6) Night (7pm-3am)	Total time spent in the activities considered	MDCNEV

Authors	Application Focus	Data Source	Discrete alternatives		Continuous component	Model Type
			# of alternatives	Alternative labels		
Rajagopalan <i>et al.</i> , (2009)	Activity time-use: Develops a comprehensive, high resolution, out-of-home non-work activity generation model that considers daily activity time-use behavior and activity timing preferences	2000 San Francisco Bay Area Travel Survey	Forty three (one in-home activity, 7 out-of-home activity purposes disaggregated into 5 time periods)	Activity purposes: (1) In-home (IH) activities, (2) Out-of-home (OH) meals, (3) OH maintenance shopping (4) OH non-maintenance shopping, (5) OH recreation, (6) OH meals, and (7) OH socializing and (8) OH pickup/Drop off Activities 2-8 are further disaggregated for the following time periods: (1) Early morning (3am-7am), (2) Morning (7am-9am), (3) Late morning (9am-12 pm), (4) Afternoon (12 pm-4pm), (5) Evening (4pm-7pm), and (6) Night (7pm-3am)	Total time invested in all activities	MDCNEV
Bhat and Sen (2006)	Household vehicle ownership: Modeling simultaneous holdings of multiple vehicle types	2000 San Francisco Bay Area Travel Survey	Five vehicle types	(1) Passenger car, (2) Sports Utility Vehicle, (3) Pickup truck, (4) Minivan, and (5) Van	Annual mileage of present use	Mixed MDCEV
Ahn <i>et al.</i> , (2008)	Household vehicle ownership: Analyzing how the adding of alternative fuel passenger cars to the market affect passenger car demand pattern	2005 SP survey (with hypothetical alternative fuel vehicle alternatives) of residents of Seoul, South Korea	3 + number of passenger cars owned by respondent	3 hypothetical alternative fuel vehicles + passenger cars owned by respondent	Annual mileage of present use	Random coefficients MDCEV model estimated using the Bayesian procedure based on Gibbs sampling
Bhat <i>et al.</i> , (2009)	Household vehicle ownership: Two level nested model that analyzes the choice of vehicle type/vintage and usage in the upper level and the choice of vehicle make/model in the lower nest	2000 San Francisco Bay Area Travel Survey	Twenty one (10 vehicle types with old and new categories + 1 non-motorized mode)	(1) Non-motorized mode, Vehicle types: (1) Coupe (2) Subcompact Sedan (3) Compact Sedan (4) Mid-size Sedan (5) Large Sedan (6) Station Wagons (7) Sports Utility Vehicle (8) Pickup Truck (9) Minivan and (10) Van	Total annual household mileage	MDCEV-MNL
Rajagopalan and Srinivasan (2008)	Household modal choice: Examines mode choice decisions to integrate mode choice and mode usage by considering mode choice as a household level decision	2004-2005 Chennai (India) Household Travel Survey	Five modes	(1) Non-motorized mode, (2) bus, (3) train, (4) personal vehicle, and (5) intermediate public transit	Total travel expenditure on transportation	MDCEV

Authors	Application Focus	Data Source	Discrete alternatives		Continuous component	Model Type
			# of alternatives	Alternative labels		
Ferdous <i>et al.</i> , (2008)	Household expenditures: Analyzing household expenditures for transportation-related items in relation to a host of other consumption categories	2002 US Consumer Expenditure Survey data	Seventeen categories of expenditure	(1) Housing, (2) Utilities, (3) Food, (4) Alcohol and Tobacco products, (5) Clothing and apparel, (6) Personal care, (7) Household maintenance, (8) Entertainment and Recreation, (9) Education, (10) Health Care, (11) Business Services and Welfare Activities, (12) New/Used Vehicle Purchase, (13) Gasoline and Motor Oil, (14) Vehicle Insurance, (15) Vehicle Operating and Maintenance, (16) Air Travel, (17) Public Transportation	Total annual expenditure	MDCNEV
LaMondia <i>et al.</i> , (2008)	Vacation travel: Examines how households decide what vacation travel activities to participate in on an annual basis	1995 American Travel Survey	Five categories of leisure vacation travel	(1) Visit relatives or friends, (2) Rest or relaxation, (3) Sightseeing or visit a historic or scenic attraction, (4) outdoor recreation, and (5) Entertainment	Total time (in days) spent in the five vacation categories	Mixed MDCEV
Vasquez and Hanemann (2008)	Angler's site choice: examines angler's site preference based on individual angler preferences	1986 Alaska angler's site choice dataset	One hundred eighty one "sites"	Each "site" is a combination of macrospecies (3)/subspecies (12) /site (29). All 29 sites are not available for each subspecies	Travel cost to the various sites	Non-additive MDCEV model structure