

Transport Geography in Israel 1980-1984

A Review

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Introduction

Israeli Geographers have made numerous contributions to the field of transportation geography in the period since the last Congress of the International Geographers' Union. This paper reviews the work of seven geographers and regional scientists. Two major objectives of the review are: i) to present a picture of the major directions of recent and current research, and ii) to provide a framework suitable for a comparative classification of studies in the field of transportation geography. The latter may serve as a basis for a suggested research area undertaken by the IGU Transport Geography Workgroup.

The first part of this review presents a classification of the studies performed in the 1980-1984 period. Section Two presents abstracts of selected studies. Section Three lists the contributors, their affiliations and a listing of their recent work.

A Classification of Studies

Classification is intended to allow a reduction of data items into a small number of relevant entities about which some generalizations can be made. We are not aware of any formal attempt to classify studies of transportation geography. This is true for most other areas in geography, as noted by Johnson (1976). It is possible though to identify informal or common classifications by inference from the structure of the literature

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in this area. Two major schemes are evident. First, that based on modal division, dealing separately with maritime, air and land transportation, where the latter is subdivided into rail and automobile, or alternatively into public and private modes. The modal approach also distinguishes between passenger and freight transport. The second scheme is differentiating studies by the scale of the geographical area they deal with. This classification ranges from local or intra-urban scale, through the metropolitan or regional to the national and international scales. These schemes can be viewed as inductive in nature, classifying the research body based on an «inventory» of transportation, and with a frequent, though not absolute, bias toward the supply side, that is to say, the technology.

To allow for a meaningful review it is suggested to classify studies in transportation by their conceptual contribution to four broadly defined categories:

- *Theory*: Studies which broaden the validity of general or particular theories on behavior and spatial interaction, contributing to a universal understanding of phenomena.
- *Methodology*: Studies which address issues of how questions are asked of the ways and means to answer them so that validation of theories can be achieved.
- *Problem-solving*: Studies geared to improve the welfare or economic state of parties involved in particular situations. For example, improve the welfare of users or operators of transport systems, reduce social costs associated with congestion or pollution, etc.
- *Regional*: Studies which deal with a limited geographical area, of any scale. It is possible to divide this category into two types. One is of actual regions and the second is of abstract regions, characterized by some attributes like «urban» or «arid zones».

Many studies can, of course, fall into more than one category. Therefore, we have followed the classification matrix scheme used by Golob and Golob (1982) in which each study can be a combination of a main orientation (rows) and a secondary orientation (columns). Research items that clearly fall within more than two categories appear twice.

Before displaying this matrix it is useful to make a few observations on the nature of this classification. First, given the four categories, it is possible for researchers to tackle a research question with a broad range of strategies consequently adopted the classification based on the researcher's own preference.

Second, the problem-solving orientation of transportation science is transparent in most studies in this area including those undertaken by

transport geographers. The substantiality of the problem-solving orientation provides for researchers to combine applied work with contributions to theory and methodology developments, which often have also an academic value.

The third point that becomes evident from this classification is that many of the transportation studies have a universal meaning. Although some studies appear to be focusing upon specific regions, the nature of the problems addressed and more frequently so, the theory and methodology transcend in most cases beyond specific local meanings.

Table I presents the classification of studies performed by Israeli transport geographers in recent years. Included in the tables are only items which are available in European languages (English, French and Italian). Some of the work cited was performed jointly with non-Israeli colleagues.

The regional category is divided into two subcategories: those studies which address or deal with a specific, actual region and, separately, those studies which address a regional issue of an abstract region.

Let us briefly describe the content of Table I, in sequence of the rows. Only two studies are contributions to theory alone. Berechman (1980a) has dealt with the long debated question on integration of transportation and land use into a single framework. Daor (1981a) has addressed the question of the relationship between income and trip making behavior.

The category of theory-methodology contains four studies. Reichman and Salomon (1983) have suggested to evaluate space in a broader context than that of distance or cost function. They point to some situations where space, even if expressed in distance units, may have a positive utility, instead of what is merely assumed to be a negative attribute of movement. Salomon and Ben-Akiva (1983) have developed an operational measure of life style based on theoretical and empirical grounds, and suggest that it might serve as a basis for relevant market segmentation in travel behavior models. Daor (1981a) addressed a question repeatedly raised both on theoretical and methodological grounds, namely the transferability of travel behavior models.

In another study (Daor, 1980) household trip making behavior models are formulated and significantly compared for two different urban areas (London and Tel-Aviv). See attached abstract in section two.

Theory oriented studies which also address problem-solving include only a single entry in Table I. Shamir and Salomon (forthcoming) have considered on the theoretical grounds the effects of telecommuting (working at home via a computer instead of commuting, i.e., substitution of travel by telecommunications) on the quality of working life. Their main conclusion is that context specific moderating variables will determine the direction of the effects and, both positive and negative effects should be expected.

Two studies are included in the theory-regional cell. Ramon (1982) has analyzed the effects of sociological factors on travel behavior in an urban

Table 1
A classification of studies in transport geography

	Theory	Methodology	Problem-solving	Regional	
				actual	abstract
Theory	Berechman, 1980a Daor, 1981b	Reichman & Salomon, 1983 Salomon & Ben Akiva, 1983 Daor, 1981a Daor, 1980	Shamir & Salomon, 1983	Ramon, 1981	Berechman & Paaswell, 1983
Methodology		Berechman, 1982	Ben Akiva, Salomon & Silman, 1983 Haitovsky & Salomon (in-progress) Hayuth, 1980a Hayuth & Wydra (forthcoming) Daor & Pleager, 1983 Daor, 1983	Reichman & Ramon, 1982 Berechman, 1980c Berechamn, 1982 Hayuth & Wydra, 1982 Karmon, 1975	Reichman, 1982 Andan <i>et al.</i> , 1983a Andan <i>et al.</i> , 1983b
Problem-solving		Stern, 1983a	Reichman, 1983c Salomon, 1984 Salomon & Salomon (1984) Hayuth, 1980b Hayuth, 1982a Hayuth, 1982b Hayuth, 1982c Karmon, 1982	Stern & Hayuth, 1984 Stern, in progress Hayuth, 1983	Stern, 1982 Stern (forthcoming)
	actual	Berechman and Giuliano, 1983 Karmon, 1980	Stern, Hayuth & Grardus, 1983 Stern, 1983b	Karmon, 1980 Karmon, 1976	
Regional	abstract				

region, using Jerusalem as an example. It appears that mobility deprivation and excessive travel are partly determined by basic attitudes toward travel.

Berechman and Paaswell (1983) dealt with the effects of investments in rail rapid transit on CBD revitalization plans. They developed a methodology for analyzing effects beyond the users benefits and provided empirical tests of the methodology, based on the Buffalo, New-York new light rail system.

In the second row, one study is included in the purely methodological cell. It is a development of a methodology for corridor transportation planning by Berechman (1982). The category combining methodology and problem solving is, as expected, frequently encountered in transportation studies. Ben-Akiva, Salomon and Silman (1983), developed a disaggregate model for mode and destination choice for holiday trips. This approach, widely applied to urban travel in the past is found to be relevant for less frequent travel decisions as well. Haitovsky and Salomon (in progress) have developed a methodology for estimating the «survival time» of a vehicle in parking space, using life tables estimated by data from periodic photographs of parking facilities. Hayuth (1980) has collaborated with others to provide a new perspective on port growth and management.

Hayut and Wydra (forthcoming) have addressed a very specific problem, that of determining the optimal dimensions of a coal discharging terminal. Daor and Pleager (1982), in a framework of urban transportation planning, have developed a simplified approach to estimate the performance of transportation systems so as to enable ranking for public investment decisions. The last study in this category is a contribution to data collection methods in transportation studies. Daor (1983) has developed a two stage sampling procedure in which the initial sampling was used to plan the final one. In this way, the efficiency of the final sampling was increased so as to justify the investment in the initial phase. (See attached abstract.)

Five studies combine methodology and actual regions. Reichman and Ramon (1976) have used data from a personal travel survey in Israel to assess the relationship between sociological characteristics and travel patterns. Berechman (1980c) has used the Israeli public transportation subsidization scheme to draw lessons on this recurring policy issue. Also in this category are two studies dealing with maritime transport. Hayuth and Wydra (1982) dealt with the optimal design of a coal import terminal, using the Ashdod port as a case study. Karmon (1975), developed a model of the spatial growth process of Western European port cities.

Three studies fall in the methodology-abstract region combination (Reichman, 1982; Andan *et al.*, 1983a, and Andan *et al.*, 1983b). All three were designed to monitor travel behavior modifications following residential relocation in a large metropolitan area.

Problem-solving is the second most populated row with 15 items, com-

pared to 16 in the previous row. The problem-solving-methodology combination includes one study, by Stern *et al.* (1983a). They developed a method for analyzing the relationship between driving efforts and route choice, as described in section two.

The single most populated cell is that of the cross section of problem-solving studies. Included here are studies which deal with broad policy issues as well as very specific problems. Reichman's (1983) book provided a discussion of the nature of transportation: is it a service or a right for mobility? The main conclusion is that transportation is, by nature, a political good that has to be dispensed by a political process (see abstract in section two). Salomon (1984) provided a critical assessment of the telecommuting concept, raising some doubts as to the likelihood of its achieving desired transportation system benefits. Salomon and Salomon (1984) developed some hypotheses about the employee's perspective on working at home, suggesting that the journey to work serves as a desired buffer between home and work roles (see attached abstract).

Hayuth's studies focus on a number of problems in the area of maritime and freight transport. Intermodal transportation and the relationships between ports and hinterland are examples of these contributions. The relationship between port ownership and its performance and structure are analyzed by Karmon (1982), as described in section two.

Studies in the problem-solving - actual region include the following items: Stern and Hayuth (1984) dealt with the development effects of ports which are maintained because of their geopolitical role rather than their economic viability, using the Eilat port as an example. Hayuth (1983) analyzed the evolution and competitiveness of air cargo in Israel, in view of the country's unique geopolitical and economic situation (see abstract). Stern has made two contributions to the study of transportation in arid zones. The first is an evaluation of public transit service in rural arid zones, from the users' perspective (Stern, 1982). The second takes a policy perspective, dealing with the provision of transit services in these zones (Stern, forthcoming, described in section two).

Contributions with the regional theme as the major focus are the least in number, compared to the previous rows. All of the studies in this area deal with actual regions. This is different from the case where the regional issue is the secondary theme, in which some studies have dealt with abstract regions. None of the studies in this row attempts to contribute to theory.

Berechman and Guiliano (1983) have performed a cost analysis, using an econometric approach for urban bus firms. The study used data from California. Karmon (1980) has written a book on Ports Around the World, describing the structure, history and development of ports at various locations around the globe. This is a major contribution as a source book for information on ports at actual regions, and therefore appears as a combination of major and secondary themes of actual regions. But, this study

also serves another secondary theme, and therefore appears twice in this row. It presents a thorough methodology for description of ports in different parts of the world.

Stern, Hayuth and Gradus (1983) have addressed a subject which falls into the combination of regional and problem-solving issues. By studying the southern part of Israel, the Negev, they have focused on its role as a continental bridge from the Red Sea to the Mediterranean, which is an intermodal transportation system.

Stern (1983b), has elaborated on the possible disintegration of Israel's transit system into regional systems which could better meet the needs of population groups in different regions. This follows some other studies by Stern on the unique needs for transit systems in arid zones. Both the latter studies have a very strong orientation to problem solving although their major theme is regional in nature.

A very specific study of a single transport facility is provided by Karmon (1976), who studied Eilat as a port in the desert.

Conclusions

As one might expect, the cross-section of problem-solving studies is occupied by the largest number of items. This is consistent with the general orientation of transport studies noted above. This also explains the continuing interest of the scientific community in transportation problems and the fact that transportation problems are difficult to decompose. It should be noted, however, that we have used a broad definition of problem-solving which includes the presently emerging field of political and policy aspects of transport geography.

It is also evident that regional issues, at both actual and abstract notions, serve as a supplementary orientation to many studies of all three major directions. Yet, the bottom row, that of abstract region as a main orientation, is an empty group. This again emphasizes the general problem-solving orientation which employs actual regions as a source of problem definitions. It may also be a spurious outcome of the fact that our sample included mostly geographers rather than hard core regional scientists.

The incidence of purely theoretical studies is small. Four items are classified in the theory-methodology combination and they deal primarily with issues of urban travel behavior.

The methodology-problem solving combination includes six items which address two subject areas: policy oriented urban travel studies and maritime transportation.

Among the two columns of studies with a regional orientation, that of actual regions includes more items than that of abstract regions. Actual regions in Israel serve as contexts for only six of the eleven studies in this

category. An interesting outcome of the classification is the fact that a significant number of studies by Israeli geographers use problem areas which do not occur in Israel. It also indicates that numerous case studies of the Israel context have implications which extend beyond the local readership.

In more general terms, the list of publications demonstrates the emergence of at least three subject areas in which the current work of Israeli transport geographers specialize:

- Geographical aspects of travel demand or spatial behavior, particularly in the urban environment (Berechman, Daor, Ramon, Reichman and Salomon).
- Maritime transport and ports (Hayuth and Karmon).
- Regional transport in arid zones (Stern).

Although in each of these subject areas, generally, has roots in the study of Israeli problems, the level of expertise that has been achieved to date, has reached beyond the limits of the country and a majority of the Israeli transport geographers have been actively engaged in both basic and applied research in other countries.

ABSTRACTS OF SELECTED STUDIES

BERECHMAN YOSSI

Costs, economies of scale and factor demand in road transport

This study uses a two-factor translog cost function model, which is subject to very few a priori economic restrictions, to investigate the cost structure of bus transport, analysing relationships between production costs on the one hand and output and input factor prices on the other, and particularly the demand for factors of production, factor substitution and price elasticities. The data use represents the Israeli bus sector. The empirical results include scale economies, fixed factor proportions-type production technology, non-linear separability of factors incost functions, and small own-price elasticity of demand of labor relative to capital.

BERECHMAN YOSSI

Transit subsidies and regulation: Lessons from the Israeli case

The Israeli transport sector, like those of many other countries, is subject to complete government control with regard to fares, entry into the market, terms of operation and subsidies. It is unique however, in that

the fares charged are remarkably low, and that the major transit mode, buses, is operated by privately owned companies. This paper explores what makes this low level of fares possible, and in doing so examines the principal characteristics of the sector. It shows that this phenomenon cannot be explained by the amount of subsidy given to the operators but must be attributed to other factors, mainly the efficiency in the production of the services which is motivated by the profit maximisation objective of the operators. The paper further argues that government policies regarding subsidy and regulation are generally inefficient as they cause misallocation of resources.

DAOR ERELA

An analytical formulation of household trip making behavior in urban areas. A comparative study

In this study a residential trip generation model was formulated and tested on data from two metropolitan areas London and Tel-Aviv. The model was based on the premise that household trip generation behavior is a function of the household's characteristics measured by socio economic variables and the characteristics of the place of residence measured by spatial/location variables. The data was analysed by the analysis of variance technique, and separate models work and OHB trips were developed for each case study. The models were kept as simple as possible by avoiding unnecessary transformation of and interactions among the independent variables. The study adopted a hierarchical zoning system, consisting of several levels of spatial aggregation. This system made it possible to examine the effect of location at different levels of spatial aggregation, and to design the models accordingly. The empirical findings highlight two important aspects of the trip generation models as developed here. The first is that the number of independent variables which enter the model equation is very small. The second is that significant locational variations were found only between higher levels of spatial aggregation (sectors or rings). An important corollary of the findings was the need to differentiate between work and non-work trips, since it was shown that the travel determinants were different in each case. This trip generation model does not attempt to explain residential location, though the choice of location is, certainly in part, a transportation decision. Location clearly influences household available options, and thus their choices. The effect of location is accounted for in the model not directly as an independent variable in the model equation, but through the chosen level of spatial aggregation. This is mainly because location, both in its absolute and relative senses, represents a variety of variables, many of them hard to measure and intangible. The trip generation models have been

stratified to reflect the different trip generation patterns arising from the spatial structure of the study area, its historical urban growth, and the configuration of the transportation system. Moreover, it seems that by stratifying the model, account is taken of the possible different utility functions of households which choose to live in different parts of the metropolitan. The findings of the research clearly indicate the dependencies of trip making behavior on the urban spatial structure. Further research is required to analyse systematic inter-urban variations in both the structure of the environmental opportunities and the choice of trip frequency.

DAOR ERELA

The role of sampling design in transport analysis

This paper describes the development and application of a multi-stage stratified sample design to a study set-up to estimate the revenue that public transport operators in Israel would have received from servicemen were the latter not granted free travel on inter-urban bus lines. No data were available on the travel behavior of servicemen and a two step sample was used to allow the calculation of an intermediate at the end of the first two months. The decision to calculate an intermediate and defer the estimation of sample size proved crucial. It turned out that the precision of the intermediate estimate was 35 %, which was unacceptable. However, the data collected in the first two months were invaluable and were used to redesign the sample and calculate its size. A stratified sample with strata defined according to the expected daily bus line revenue (from servicemen) was employed. With this design 6000 trips were sufficient to obtain the desired precision of 5 % for the estimate of total revenue. The main conclusion that can be drawn from the study is that the sample design is a critical variable affecting the precision that can be obtained. The increase in precision can more than justify the extra work incurred by a more complicated design than a simple random sample.

HAYUTH YEHUDA

Containerization and the load center concept

This study examines technological changes in ocean transportation, with an emphasis on containerization, in light of their effect on seaport systems and on their closely related components: hinterlands, forelands and ocean trade routes. During the last two decades ocean transportation has experienced rapid changes. Not only have the size and draft of ships increased spectacularly, rendering many older ports unusable, but the methods of handling cargo have been drastically modified. Naturally, not

all ports are equally ready or able to meet these requirements, thus, the acquisition by ports of advanced technology occurs unevenly.

The focus of the investigation is on the dynamics of the container port system with a particular emphasis on the phenomenon of «dominant container ports». The hypothesis that container port systems are dominated by a few large container ports will be tested. Oceanborne container traffic according to this postulate, would be concentrated in a limited number of large-scale ports, casting a traffic shadow over secondary, feeder ports. The validity of the dominant port hypothesis will be appraised in the context of United States ports which operate in a competitive environment with very little federal direction of port development. A five phase model illustrated the dynamic development process of a container port system and the rationale behind such development. The phases included the preconditions for the changes, the initial container port development, the diffusion, consolidation and port concentration and load center stage and the challenge of the periphery. Containerization was introduced into ocean trade largely to improve the turn-around time of ships in ports and to reduce the soaring cost of loading and unloading cargo. However, the effects of the new method of cargo handling are much greater, bringing significant changes in the structure and operations of ocean carriers, modifying some port functions and altering the extent and lines of movements in port hinterlands. Containerization implies a new system of intermodal transportation. This study analyzed the implications of containerization to ship operators, ports, and the inland distribution system and focused on the phenomenon of the load center port, especially on the processes and conditions which led to its development. The general hypothesis has been found to be true in North America: the American container port system is clearly dominated by a few container ports. However, the matching of time periods in the United States to phases of the model is less complicated for the early phases than for the later ones. Perhaps the most controversial aspect of the model-testing procedure is the selection of the precise criteria to define the load center. A port container cargo throughput of 250,000 TEU, as in this study, is admittedly somewhat arbitrary. Moreover, we are dealing with a very new dynamic system, which means that the measure of traffic which might define a load center today would not be appropriate tomorrow. It could be argued that a criterion of percentage participation in container traffic might be more useful. Had this been used in the North American case, with an appropriate division of port ranges, the major load centers mentioned above would still make up the list.

Among the various factors that contribute to the concentration of container traffic in a limited number of ports, the most important appear to be: the economics of container ship operation (particularly the time costs of port visits), the economics of large scale container terminal operations and the tendency to channel the inland distribution of containers into

high volume track routes. It is difficult to weight the importance of each factor in the development of a load center port. A large local market is an important consideration. For some ports, location is a leading factor; for others, it is an adequate site.

Analysis of the load center ports of the United States reveals that the role of aggressiveness of management is another prime factor. In most cases, it is a combination of several factors that provide a port with a relative advantage over its competitors.

KARMON YEHUDA

The ownership of a port as a factor in its operation and physical structure

It is the aim of this paper to show, that in evaluating the importance of a port or plans for its future development, it is necessary to take into account not only the physical environment, the economic hinterland and the commercial infrastructure, but also the form of ownership and management. The latter is an outcome of the history of the port and influenced by the social and political structure and aims of the government. There exists no ideal type of port ownership. Certain activities are better performed under central administrations, while others would benefit more from free enterprise. The actual situation is, that in many ports there exist a number of ownership types, in forms of leases of land or concessions for certain activities, of advisory boards and other representatives of the port's users or the general public. It seems that in many cases a new development of a port also necessitates changes in its administrative structure and responsibilities.

REICHMAN SHALOM

Les transports: Servitude ou Liberté?

Quand on étudie les effets des transports, tant en secteur économique qu'en secteur géographique des questions se posent:

1. Pourquoi y a-t-il obligatoirement des gagnants et des perdants, en termes d'accessibilité et de mobilité?
2. Comment se fait-il que la voiture particulière apporte un affranchissement au niveau individuel, tout en entraînant, une servitude collective?
3. Existe-t-il matériellement un remède aux servitudes imposées, sous la forme du «droit au transport»?

Traitant de ces questions et d'autres, tenant compte des enjeux politiques et sociaux, l'ouvrage s'adresse à la fois aux chercheurs et enseig-

nants, aux aménageurs et planificateurs, ainsi qu'aux décideurs dans le secteur des transports.

SALOMON ILAN

The use of the life style concept in travel demand models

This paper describes the utilization of the concept of life style in the context of travel demand models. Life style is defined as a pattern of behavior under constrained resources which conforms to the orientations an individual has toward three major «life decisions» he or she must make: a) the formation of a household (of any type), b) the participation in the labor force, and c) the orientation toward leisure. A population is classified into life style groups based on similarity in a multi-variate space. *Socio-economic and demographic variables define that space, and emphasis is put on variables which are indicative of emerging new life styles (e.g., the relative contribution of the female spouse to the household income).* Cluster analysis is employed to identify the life style groups.

Models for the choice of mode and destination combinations for shopping trips are estimated for the pooled sample and the life style segments. Comparisons of these models with the performance of other market segmentation schemes and with the pooled model demonstrate that the life style groups account for taste variations better than the other schemes.

SALOMON ILAN

«Telecommuting»: The employee's perspective

Available telecommunication technology enables the substitution of commuting by «telecommuting» or working at home, for a wide range of white collar occupations. Research on the potential of this phenomenon along with some on-going experiments point at an array of social and personal benefits which any be realized by this working arrangement. However, an assesment of the possible implications of work-at-home on the individual employee indicate that the burden on him or her may be greater than the benefits accrued and therefore, the journey-to-work may be a more *desirable* act than traditionally perceived by transportation planners.

This paper focuses on two aspects of the work-at-home arrangement. Previous research on the sociology of work as well as preliminary empirical results indicate that 1) social interaction at work and 2) the need to separate home and work roles are important elements for the individual worker. The fact that work-at-home will affect these attributes, is likely to discourage wide scale transition to this arrangement, despite the avai-

lability of the technology. Most research published to date on the subject is qualitative in nature, as only little empirical evidence is available. The objective of this paper is to stress, based on a wide literature review, the need for a thorough behavioral evaluation of the available technology to provide a sound basis for decision making on implementation of the technology.

STERN ELI

Driving Efforts and Urban Route Choice

Time related variables are not the only ones to be considered in traffic assignment procedures. Driving efforts measured with a psychological scale have been found of considerable influence in the individual's route choice process. Driving efforts are more effective in short link transportation systems (short either in time or in route length) characterised by relatively high driving speed. Directions toward the explicit measurement and integration of driving efforts in route choice models are put forward.

STERN ELI

The provision of transit services in arid environment

Arid areas are characterised by dispersed patterns of population and economic activities in a hot and dry environment. The emerged time-space behavioral patterns in the arid environment are consequently different from the respective patterns in more humid areas. The different behavioral patterns imply somewhat different demand patterns for service provision in general and transit services in particular. Good access to the scattered low order of opportunities is of prime concern in the sparsely populated arid areas. However, due to the spatial conditions the demand patterns dictate special transit utilization patterns which in turn raise the need to develop uncommon supply patterns based on conditional local service standards. This study is first aimed to present the inter-relationships between the arid spatial conditions, the transit demand patterns, and the transit supply requirements. With examining the required service standards in the sparsely populated arid area, using the Israeli Negev as a case study, guidelines for developing regional transit systems in these areas are put forward.

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