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**PROGRESS REPORT**

**Transport Research Program**

June 12, 1965 - December 12, 1965

**The Brookings Institution  
Washington, D.C.  
December 12, 1965**

## Transport Research Program

### I. Studies completed

Three new manuscripts are being readied for publication by Brookings:

	<u>Publication Date</u>
Government Controls on Transport: An African Case, Edwin T. Haefele and Eleanor B. Steinberg	December 20, 1965
The Impact of Highway Investment on Development, George W. Wilson, and Barbara R. Bergmann, Leon V. Hirsch, and Martin S. Klein	Spring 1966
Transport and the Economic Integra- tion of Latin America, Robert T. Brown	Spring 1966

In addition, the following studies were completed during the last six months and have been submitted to AID:

Preparation and Appraisal of Transport Projects	Clell G. Harral
The Spatial Efficiency of the Soviet Cement Industry	Alan J. Abouchar
Programming Investment in the Steel Industry in Latin America	David Kendrick

Books previously published include Wilfred Owen's Strategy for Mobility and Gary Fromm's Transport Investment and Economic Development. Nuhad J. Kanaan's study, The Structure of the Transport Network in Syria, was also previously submitted to AID.

## II. Studies now in manuscript include:

Transportation and Food	Wilfred Owen
Transport or Communications: An Approach to Decision-Making in Developing Countries	Paul S. Shapiro
Middle East Transport and Economic Integration	Nuhad J. Kanaan
Malaya Case Studies of Highway Impact	William B. Hughes
Transport and Energy in Economic Development: With Special Refer- ence to India	Edward S. Mason
Efficiency in the International Airline Industry	Mahlon Straszheim
Transport Administration	John Lindeman

## III. Work in progress

Work continues on the other projects which include *Transport Technologies in Developing Countries* and *Principles of Transport Planning* by John R. Meyer; *Financing Transport in Developing Countries* by Alan R. Prest; *Transport and Growth: The Soviet Record* by Holland Hunter; *Transport and Indian Economic Development* by Wilfred Owen; *African City-Hinterland Development* by Leon Moses; and *The Organization of the Transport Sector* by Edwin T. Haefele. Detailed descriptions of these projects were included in the last Progress Report.

## IV. New project

One new project, an examination of the rail pricing system of the French railways, has been submitted to the Brookings Trustees for approval. The study will be conducted by Professor James R. Nelson of Amherst College, who contributed to the earlier volume of essays edited by Gary Fromm. The study is expected to supplement the work of Professor Alan R. Prest.

## V. Education and Training Activities

### A. Harvard Transport Research Seminar

Approximately 60 graduate students have participated in the Harvard Seminar, and over 30 staff papers have been prepared on various aspects of the program. Details of research progress are contained in the Appendix.

### B. Staff Activities

E. T. Haefele was Co-Chairman of the Transportation Committee for the Conference on the Application of Engineering Technology to the Problems of Appalachia. His article on "Urban Transport: Who Decides?" appeared in Public Administration Review, September 1965. He continued to consult with AID and State Department officials concerning specific problems of South Central African transport.

Holland Hunter's article on "Transport in Soviet and Chinese Development" was published in Economic Development and Cultural Change, October 1965.

Wilfred Owen presented papers on "Aviation and Latin American Development" at the meeting of the Aerospace Industries Association, New Orleans, October 6, 1965, and participated in a seminar on Transportation and Agriculture in the Developing Countries, sponsored by the Agricultural Development Council and the University of Connecticut, Hartford, Connecticut, September 13-14, 1965. He has also served as a member of the Transportation Committee for the White House Conference on International Cooperation Year, November 29, 1965. Lectures at the Washington International Center have included "Lessons from U.S. Economic Growth for the Developing Countries," August 10, 1965; and "The Urban Economy of the U.S. and of Newly Emerging Countries," for the AID-sponsored mission on housing and urban affairs.

### C. Activities of Former Staff Members

Former staff members now in the field include Robert T. Brown and Nuhad J. Kanaan, who are participating in the AID-supported Chile-California Program in Santiago; Tillo E. Kuhn, who is conducting research at the Center of Planning and Economic Research in Athens; Alan J. Abouchar, who is working for the AID-supported research staff in the Ministry of Economic Planning in Rio de Janeiro; and Clell G. Harral, who is a member of the World Bank advisory staff to the Government of India working on the Regional Transport Survey in Calcutta. Richard Weisskoff, a former member of the Harvard Transport Research Seminar, participated in the AID Northeast Brazil study mission during the past summer.

## Appendix

### Harvard Transport Research Program Report

The main effort during these last six months has centered on the two major study areas: development of (1) improved procedures for individual project evaluation and (2) a more comprehensive model for testing the appropriateness of different transportation plans or systems. In large measure the basic research for the individual project evaluation study was completed during these six months. The major task now is to consolidate the different pieces of work into a written report.

Work on the "economic portion" of the more comprehensive systems model is now essentially complete. Several trial runs have been made to calibrate the model and to determine its sensitivity to different parameter estimates and levels of exogenous variables. The initial calibration and sensitivity runs were performed using mostly Pakistan data. In many respects this is one of the more complex and complete models now available for evaluation of development plans.

Advances have also been made in developing the transportation portion of the overall systems evaluation model. (The early runs of the economic portion of the model were performed with a highly simplified version of the transportation model inserted as a "filler.") Probably the most original aspect of the transport model research over the last six months has been the development of technology evaluation models for road and rail. Basically, these are sub-systems (for later incorporation into the overall transport model) that permit evaluation of different technological choices with regard to road and rail and selection of that choice (or choices) that appear to be roughly or nearly optimal in terms of costs or service characteristics. For example, the road model incorporates as exogenous variables specifications about climate, general terrain, and traffic volume; it then evaluates the cost characteristics of different choices of vehicle, highway gradient and highway type in performing the defined services under the stated external circumstances. The rail model does much the same thing for rail, though the crucial variables are considerably different. These two models have now been completely computerized and have yielded sensible results when tested under a fairly wide range of circumstances. Richard Soberman and Paul Roberts have been the main contributors.

One particular aspect of these road and rail technology evaluation models should be noted: they are considerably more open-ended and comprehensive than models conventionally used for these purposes. Specifically, both equipment and right of way development are included as choice variables. In the rail mode, moreover, different procedural choices on operations play a prominent role. Of course, the model achieves some of its more comprehensive system characteristics by sacrificing some detail on certain engineering characteristics; it would seem, however, that these engineering characteristics can be well specified using readily available computer programs on a suboptimization basis after the basic model and system characteristics have been determined by the overall model.

A technology evaluation model similar to that already developed for road and rail would be eminently feasible for air transport as well. The basic parametric requirements and data for such a model have already been developed. The passenger transportation aspects of this research have been reported in Discussion Paper No. 28, "Air Passenger Technology for Developing Countries." It is not obvious at this time, however, whether it will really be rewarding to computerize the air models since the technological choices appear much more limited and obvious than in the cases of road and rail.

Work has also proceeded on development of the link assignment and service evaluation sub-models for the transportation model. At the moment, the primary focus of the transport model research is on the development of a sub-model for evaluating the performance characteristics of different technologies for performing the transfer function between different modes of transport. The problem of joining the transport portion of the overall evaluation model to the economic portion of the model still remains to be done.

Two members of the project were also involved in considerable field work on an individual basis during this past summer. Donald Shoup, at the invitation of the Harvard Development Advisory Service, spent August and September working on the port problems of Liberia under the direction of Professor James R. Nelson of Amherst College. Shoup also spent some time visiting other African ports to gather material for his doctoral dissertation, "The Role of Port Investments in Economic Development." Shoup's work in Liberia was financed jointly by the Development Advisory Service and by Graduate School of Public Administration funds made available to our project for purposes of overseas travel.

The other individual in the field during this past summer was Richard Weisskoff who was a member of an AID team visiting the Brazilian northeast and studying the transportation problems of that region. This liaison has proven mutually beneficial. Through Weisskoff, data were supplied on different transport technologies (much of which was related to or derived from the road-rail technology research described in previous paragraphs). In turn, some important inputs were obtained for developing the transfer model.

There have also been a number of subsidiary studies. Though not directly connected with developing the project evaluation or overall transport model studies, they nevertheless have made important contributions. One study of this type is Donald Shoup's, already mentioned. This work, besides providing some general material on the potential and actual contribution of ports to economic development, could also be a good source of technological inputs into the transport evaluation model.

Much the same is true of Mahlon Straszheim's work, already complete, on the international airline industry. As noted, Straszheim developed as a by-product of his work needed materials on technological choices in the airline operation. His study itself is easily the most definitive work on the general subject of international airlines yet available. The editing and revision of this study are nearly completed, and a final manuscript will be submitted next month.

Another "peripheral" study that was completed during the past six months, by Hrishikesh Vinod, deals with the problem of incorporating into Leontief-type input-output tables the flexibility required to deal with problems of variable returns in production. Vinod has developed a new method for introducing this kind of flexibility. Vinod's work relates to the other work of the project in the sense that input-output models play a major role in developing the industry characteristics of the general economic model. Vinod's ideas thus would provide a relatively simple means of greatly improving the flexibility and, potentially, the forecasting accuracy of the general economic model over time.

Finally, Carlos Hurtado of the Instituto de Economía of the Universidad de Chile, has been in residence this fall semester, finishing his Ph.D. dissertation which deals with problems of estimating geographic population distributions at different stages of economic development. While he has focused his principal attention on Chilean development, the general model of population distribution that he has developed would appear to have considerably wider application.