

Relationships Between Public Transport Finance and National Economy in The Netherlands

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In 1993, expenditure on all forms of public transport in the Netherlands amounted to 4.6 million Dutch guilders. This sum accounted for some 62 percent of all central government expenditures on infrastructure and transport. A research project was undertaken to examine the economic rationality of such expenditures and to study the relationships between government expenditures on public transport and the national economy. The primary objectives were to identify the economic linkages and to determine the extent to which money spent on public transport contributes to economic development. Phase 1 of the study consisted of a comprehensive review of the literature to gain insights into the complex relationships and to compile an inventory list of economic effects. In Phase 2 a conceptual framework was developed and a pragmatic methodology was designed so that identified economic effects can be quantified and monetized. In Phase 3, the Sector and the User Approaches devised in Phase 2 were evaluated. On the basis of the results of practical applications on the total public transport program and on the Rail 21 project, it is suggested that the methodology is capable of providing a coherent way for integrated estimations of economic effects to be attributed to public transport finance.

The maintenance of an efficient public transport system plays an important role in the Netherlands' Second Transport Structure Plan (SVV-2) and in the National Environmental Policy Plan 2 (NMP-2). In these policy documents, conditions are laid down for the future development of mobility to achieve four policy goals: improved accessibility, guided mobility, quality environment, and enhanced road safety. A shift in the modal split in favor of public transport is warranted, especially for journeys to work in areas where public transport offers a realistic alternative to car use. This relatively new role for public transport in strategic planning represents a shift in emphasis in recognition of the facts that continuous growth in travel demands cannot be met uninhibited and that efficient use of public transport will help to ease congestion on the roads. The proposition is that scarce road space can be better utilized for business trips and for road freight, both of which play an important part in promoting the country's economic well-being. Another consideration is that better use of public transport will help to promote the environmental goals to mitigate air pollution, reduce noise, and minimize severance (features that are often associated with the road program).

In the same period, the Dutch government has embarked on a program of reforms to strengthen the national economy, in particular by reducing the size of the public sector and cutting back the level of financial supports. In transport planning, the explicit aims are to reduce the amount of subsidies given to public transport and

to increase the cost effectiveness of government-funded programs. In 1993, total expenditure on all forms of public transport amounted to 4.6 million Dutch guilders. This accounted for some 62 percent of all central government expenditures on infrastructure and transport. Conversely, transport projects, particularly investment in infrastructure, are seen as a way to promote economic prosperity because they provide employment and play an important role in strengthening the competitive position of the Netherlands as the gateway to an enlarged European Union.

In strategic transport planning and in the setting of priorities, there are political considerations, social arguments, and environmental reasons for supporting specific programs. It is important to recognize the *raison d'état* in the choice of projects, particularly those that require public funding and government support. The aim of this paper is to describe a project that has been undertaken in the Netherlands to study the economic relationships between government expenditure on public transport and the national economy. The primary objective is to identify the economic linkages and to determine the extent to which money spent on public transport contributes to economic development. The exercise will provide a first step toward defining the economic worth of public transport.

GENERAL DESCRIPTION OF STUDY

The central question is: can the effects of public transport expenditures by government on the national economy be determined? The primary research objectives are to develop a conceptual framework and to design an evaluation methodology for the assessment of the economic linkages. The process involves identification of economic effects, quantification of those effects, and placement of a (monetary) value on the effects so that they can be compared with the sum of public transport finance.

The research was divided into three phases. An interim report was prepared at the end of each phase to provide informed discussions and to assist in decision-making regarding the detailed work program in the subsequent phase. Phase 1 consisted of a comprehensive review of the literature available at home and abroad, including case studies. The objectives were threefold: (a) to identify the economic factors, (b) to study the *modus operandi*, and (c) to gain insights into the complex relationships of these factors.

The purpose of Phase 1 was to compile an inventory list of the types of economic effects that are associated with spending on public transport. The emphasis is less on the theoretical aspect and more on the practical application concerning how economic effects can be grouped, measured, and quantified.

The aim of Phase 2 was to develop a conceptual framework and to design a methodology such that the economic effects could be quantified and valued. The goal was to have an integrated framework for systematic and consistent evaluation of major public transport programs.

Phase 3 was a test to ascertain the methodology's strengths and weaknesses in practical application. The test was conducted in two stages. In the first stage the economic worth of the total public transport program was appraised, with the objective of giving a general estimation of the program's contributions to the national economy. The aim of the second stage was to assess the efficacy of the methodology when it was applied to a sizable public transport subprogram that would have significant impacts on travel demands at the national level. The chosen project was Rail 21, which is a proposal by Netherlands' Railways (NS) that contributes to the SVV-2 discussion on ways and means to improve the quality of public transport. Its main feature is a three-train system with international, intercity, and local services. To accomplish this goal, the NS calls for an investment of 17 million guilders (at 1992 price level) in 1993 to 2010, and the funding would have to come from the central government.

Three consultants were invited to submit proposals, and Netherlands Economic Institute (NEI) of Rotterdam was chosen to undertake the research. The project was supervised by a steering group made up of staff members from different departments of the Ministry of Transport and from NS.

Scope of Study

Evaluation is a technical process, and the method used will serve as a tool to assist in decision making. Therefore, it is vitally important to state clearly the terms of reference so that the context within which project evaluation must take place is firmly established.

Source of Funding

The primary aim of this study is to identify the economic effects associated with all kinds of public transport finance. It is useful to distinguish between different sources of funding: whether generated by internal sources (e.g., fares revenue or advertising incomes) or received from public authorities (such as grants and subsidies from central government, provinces or municipalities). In the Netherlands, subsidies and investment funding come almost exclusively from the central government. It is, therefore, an acceptable simplification in the early phase not to analyze the effects of alternative funding methods.

Evaluation of Total Program Versus Individual Projects

This particular exercise was conducted to provide an indication of the economic effects associated with the total public transport program. For the evaluation of individual projects of an incremental nature, other methods are available, such as cost-benefit analysis (CBA), cost-effectiveness appraisal, or multicriteria technique.

Revenue Versus Capital Projects

There is a basic difference between capital projects (e.g., investment in infrastructure or procurement of new rolling stocks) and revenue

projects (e.g., extension of a local bus network or increase in service frequency). However, theoretical understanding of the structural effects of different types of projects is poor and technical knowledge of the interrelationship is even more patchy. For reasons of expediency, no clear distinction is made between the types of projects, provided that the spending will lead to substantial transport improvement.

Generative Versus Redistributive Effects

This project is geared only toward effects that have an impact on the national economy. Only generative effects create employment and stimulate economic growth, leading to a net gain in the National Income Account. If the positive effects are gained at the expense of another region, it will be treated as redistributive because the national economy in balance will not benefit from any net gain.

RESULTS AND FINDINGS FROM PHASE 1

This part of the study was not confined to public transport projects but had a more general character to cover all relevant literature on the subject. The survey (1) amounted to a statement on the state of the art at the time of reporting in December 1993.

Method of Research

Most studies were focused on the theoretical aspects of the relationship between transport spending and the likely impacts on the economy. In several cases, methodologies had been developed in the form of mathematical or econometric that were subsequently applied to published data to test the validity and robustness of the model. Some were case studies based on a comparison of the before and after situations or a documentary report on the historical development. A few were macroeconomic studies applying statistical analyses on cross-section or time-series data. Some studies took the form of prospective studies that made use of interviews with experts or relied on the results of questionnaire surveys. The revealed-preference approach was designed to examine what firms and individuals actually did. The stated-preference approach (sometimes utilizing simulation games) attempted to determine what firms and individuals would do in hypothetical situations. Scenario studies and investigations based on the Delphi technique provided some useful insights, even though such studies were largely speculative in nature and exploratory in character.

Outcomes from Impact Studies

Transport Programs in General

There are few published works on the economic effects of transport improvement on the economy. The interest of most studies was the traffic effects of infrastructure investment or changes in general mobility, rather than wider implications of improved accessibility effects on economic changes. When cases showing economic effects were singled out as a topic of interest, the results were often presented in qualitative statements which ranged from assertions or claims to platitudes with little evidence to support the case. With

regard to the importance of forward and backward linkages, the knowledge is limited (2). To take the case of the high-speed rail (HSR) projects in France (3), there were indications that the investment helped to stimulate the local economy and attracted newcomers to locate in the proximity of the HSR. But there was counter-evidence to suggest that the expected gains for the local economy did not materialize and, to the contrary, HSR worked as a suction tube, siphoning off benefits to other regions. A possible explanation is that transport improvement reduces the need for regional branch offices and has encouraged concentration of activities in the head office.

Public Transport Program in Particular

Even less is known about specific impacts of public transport programs. There are several studies on the effects of individual projects such as the Victoria Line Study in London (4) or the metro railway in Los Angeles (5). The former relied on CBA and the latter relied on effects on land use via changes in the rental values of property and land prices. The indication is that transport improvement in suitable circumstances can function as a catalyst to assist other policy measures to bring about the potential benefits or to hasten the process of change. However, research studies hitherto have not been able to establish any direct causal relationship between transport improvement and changes in the labor or capital productivity of firms located adjacent to the infrastructure. Another important issue is the extent to which it is possible to make generalizations on the basis of a small number of case studies in which local conditions often had played an important part. At present, there is insufficient evidence to make convincing generalizations.

Conclusions from Phase 1

The literature survey indicated that most appraisals were based on CBA, with permanent effects as the central focus, particularly user benefits associated with the investment project via journey time and travel cost savings. In some studies, the radiant effect was included, for example, trip generation by new users. Radiant effect refers to that group of indirect effects associated with forward linkages that could affect the economic structure over time. The proposition is that transport improvement will induce existing firms to expand and

attract new firms to the area. Likewise, employees and workers will be influenced by improved accessibility to move into the neighborhood. In a few cases, attention was also given to the temporary effect. With a few exceptions, direct effects such as employment and value added in the transport sector were rarely discussed.

The radiant effect is the most controversial topic. In some research studies, particularly those specializing in marketing, it was argued that the effect is psychological in nature and is related to an improved image and a general increase in public confidence in the local economy. Some researchers tried to construct models to analyze the changes observed in regional economic development. A few attempted to adopt a more pragmatic approach and attributed the residual effects to such forces at work. However, no one has succeeded in producing a convincing and transparent method that can illustrate accurately the multiplicity of the interactions.

The consultant recommended the development of an integrated conceptual framework and (on the basis of this thinking model) an evaluation methodology that would suit the particular situations in the Netherlands. A pragmatic approach was proposed to take on board the knowledge gained from the state-of-the-art review and to allow for the quality of data available. These recommendations were endorsed by the steering group with a request that any vital gaps in knowledge should be identified so that future research can be programmed to strengthen the methodology.

RESULTS AND FINDINGS FROM PHASE 2

NEI has followed two different approaches simultaneously, regarding them as the spearheads for investigation. The conceptual framework is to view the problem from two different vistas: the producers' angle and the consumers' angle. In the Sector Approach, the central issue is the extent to which expenditure on public transport programs acts as a stimulant to the sector that is under discussion (including feedback repercussions). In the User Approach, the central issue is the extent to which improvement in public transport leads to better allocation and more efficient use of scarce resources from the society's point of view. An increase in the opportunity to make choices and in the range of possibilities is conceived explicitly as a plus point. The relationships between the two approaches and the place of the radiant effects are given in Figure 1. Because the two approaches have different theoretical foundations and philosophical perspectives, the two set of results should not be added together.

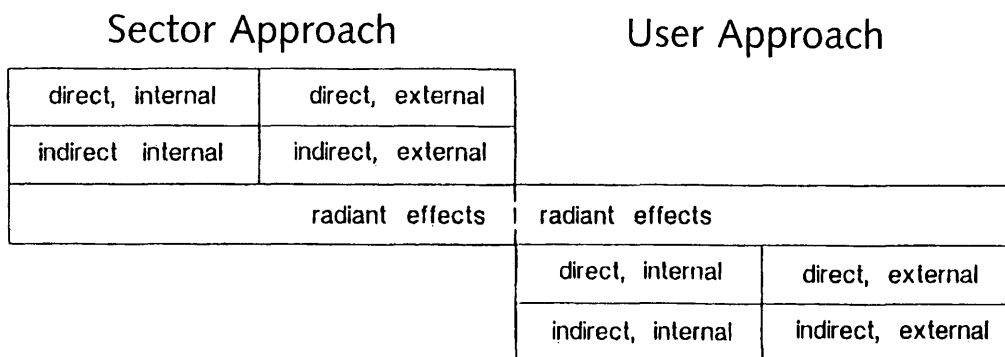


FIGURE 1 Relationships between sector and user approaches.

Sector Approach

Changes in value added and jobs creation are two major contributors to the gross national product in national income accounting. Input-output (I-O) analysis was considered to be the most appropriate method to measure the extent of such effects. Production statistics from the Central Bureau of Statistics (CBS) for the period 1988 to 1991 were used as a data source. In the I-O analyses, particular attention was centered on changes in final demands.

Temporary, Direct, and Internal Effects

Temporary, direct, and internal effects refer to values added and employment created in the construction and transport-supply industries. When values added against market price are corrected for indirect tax paid and for subsidy received, values added against factor costs are derived. These are made up of wages and salaries, social security tax, and other incomes such as interest and profits. Gross values added at factor cost are used to represent the economic effects for a comparison with the size of public transport finance. In principle, such effects can also accrue to engineering companies and consultants, but they are relatively small and thus are excluded. Another simplification is that all products are made and transport materials are supplied by companies located inside the country. Activities performed by foreign companies outside the Dutch frontier are discarded.

Temporary, Indirect, and Internal Effects

The categories temporary, indirect, and internal effects refer to impulses given to related industries, such as intermediary suppliers and delivery companies, and the chain reactions on delivery companies to the deliverers (third-order effect), and so on. To calculate these impacts, value-added multipliers and employment multipliers are used. They have been derived from statistical analyses of production statistics published by CBS. An employment multiplier of 1.48 means that for every 100 jobs that are created in the construction sector as a result of the project, 48 extra vacancies will be created in related intermediary delivery sectors and the supplying subsectors. These multipliers are fairly stable in the Netherlands because it would take considerable time before structural changes in economic relationships would emerge. However, the multipliers can be affected by technical progress or changes in business management which increase labor productivity. Rising labor productivity would mean that less labor is needed per unit of output.

Permanent, Direct, and Internal Effects

The share of gross value added at factor cost in the total turnover is extracted from the I-O tables. On the basis of total number of passenger kilometers (pkm) traveled per year and manpower needed, the number of man-years required for the production of 1 pkm is derived separately for the railways, urban transport, and regional transport. These figures were almost constant in 1988 to 1991. For the railways, a decrease in man-years per passenger-kilometer represented an increase in productivity that was attributed largely to the

introduction of the Public Transport Pass for Students (6) in January 1991, and adjustments had to be made accordingly.

Permanent, Indirect, and Internal Effects

These effects relate to changes in value added and in employment by the car dealers and garages (repairs and maintenance) subsector. Increases in public transport ridership can be made at the expense of car ownership and car use. Changes in the number of car trips and distance traveled affect the volume of sales by car dealers or the profit of rental companies. Garages and shops responsible for repairs and maintenance also are affected. An interesting point concerns whether the car left behind is being used by other members of the family or scrapped. In the first situation, the effects on the economy are smaller compared with disinvestment in cars. There are similar repercussions on the bicycle and moped industries as well as effects on dealers and spare-parts suppliers, but they are known to be small and so are excluded.

Permanent, Additional Effects

Changes in accessibility can induce companies to change location, particularly in situations in which companies need extra space to expand or firms seek new opportunities. The magnitude of such an effect depends on the importance of transport costs, journey time, and/or reliability to the activities of the affected concerns. Factories that practice the just-in-time production technique and enterprises that thrive on logistic cost savings are particularly sensitive to changes in the transport environment. Analyses of the I-O tables between 1988 and 1992 and data from company records held by the Chamber of Commerce suggested some differences in the rate of job creation among three types of companies: new branch by a Dutch company, new branch by a foreign company, and expansion of an existing company.

User Approach

The User Approach is based largely on the CBA methodology. The approach is centered on a what-if scenario compared with the situation in a base year. The basic philosophy is that of eliminating the complete public transport system in a stroke. As a result, all public transport journeys have to be made by other forms of transport. The community costs of the drastic change must be estimated (Figure 2). The parameters are journey time, costs of travel, air pollution, noise, traffic safety, and efficiency for business trips. Monetary valuations of these effects give the social costs of losing the public transport system, and this is compared with the amount of public finance to give the economic value.

This thinking model has been transformed into a pragmatic method and has provided a set of useful indicators. Public transport statistics for train services, urban services, and regional services are derived from CBS publications and supplemented by annual reports of operating companies. Displaced public transport trips are assigned to five other modes: car, motorcycle, moped, bicycle, and taxi. The diversion tables are compiled by using research findings from situations in which there was no public transport due, for example, to general strikes. Diversion is estimated for four journey purposes: work, business, education, and others and for three dis-

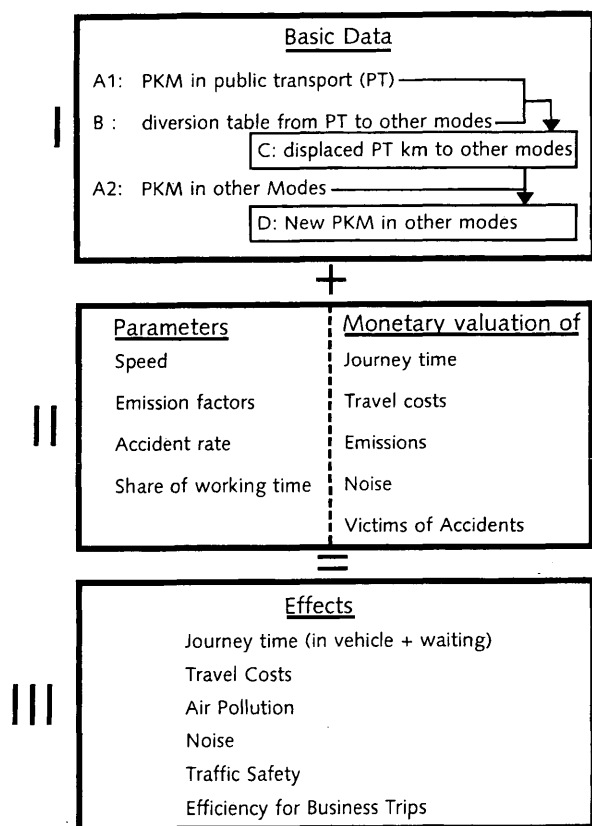


FIGURE 2 Conceptual framework.

tance classes: up to 5 km, 5 to 10 km, and more than 10 km. Average speed per mode is expressed in kilometers per hour.

Journey Time

The doing away of public transport leads to an increase in congestion on the road networks both local and regional. Changes in journey time depend on the level of congestion at any one time. It is assumed that without congestion, the average speed of a car and taxi would be higher than that of public transport modes. Changes in journey time are measured in hours and are identified separately for the passengers in the base situation per public transport mode and per journey purpose. These changes are then valued by standard values of time in Dutch guilders recommended by the Ministry of Transport. The values of travel time savings are derived from the results of extensive empirical research (7) in 1988 using revealed-preference and stated-preference techniques. These official values subsequently have been updated to give appropriate values for 1991. The next step is to estimate and monetize the effects of diversions on journey time for existing car users and taxi passengers. Some allowances are made for changes in passenger kilometers and the speed in the new and old situations.

Costs of Travel

Changes in the costs of travel per passenger kilometer in the with and without situations are estimated for each public transport mode, allowing for slight changes in passenger kilometer as a result of a

change in route choice. Short-distance trips will be replaced by walking, cycling, or moped travel, for which the cost per kilometer is lower. For people who switch to car or taxi travel, the increase in costs is greater. Only variable costs such as petrol prices, parking, and toll charges are used in the first approximation, and they are derived from empirical studies into the costs of travel in the Netherlands for different trip purposes.

Air Pollution

The elimination of public transport is likely to increase air pollution. Each transport mode has a set of emission factors for each of the six pollutants: CO₂, CO, C_xH_y, NO_x, SO₂, and aerosol. Bicycles generate no pollution, whereas cars and taxis are responsible for the emissions of NO_x, CO₂, and CO. The calculations deal with emissions at the source and are based on the assumption that the composition of traffic will change, but traffic density will remain constant. Monetary valuation is expressed in Dutch guilders per kilogram, and the equivalent table is based on the results of a 1993 NEI study (8) on effects of the opening of the Amsterdam orbital motorway on environmental quality. Emission estimation is based on existing technology and know-how.

Noise

This parameter is measured per transport mode per passenger kilometer traveled. Research study results indicated that noise level per bus or train is higher than that generated by car. The argument is based on observations that steady constant noise generated by routine traffic flows is less intrusive than the sound of trains flashing by at irregular intervals. Another argument is that to meet agreed frequency in the timetable, buses, trams, and trains have to operate as scheduled even though travel demand is low; for example, in late-evening and early-morning hours; hence, the aggregated noise emission is high. Monetary valuation is done separately per mode. The look-up table is based on research results into external costs (9) by another consultant IOO on behalf of the Transport Ministry. The calculations take into consideration the costs incurred by the government to prevent or reduce noise emissions as well as reductions in property values as a consequence of noise.

Traffic Safety

A distinction is made between fatal accidents (including accidents leading to death) and injuries. The calculation is based on the number of accidents per transport mode. This is an important consideration in the Netherlands because safety is an explicit policy goal in SVV-2. On the basis of statistical analysis, the safety record for public transport is significantly better than that for cars. The valuation table is based on the IOO study which estimated gross production losses as a result of death, sick leave, or invalidity as well as costs of indemnity payments for invalidity in accordance with Dutch laws and the costs of medical care.

Efficiency Consideration for Business Journeys

Efficiency of business journeys concerns the effective use of in-vehicle travel time, especially by business travelers doing produc-

tive work during train journeys. The argument for its inclusion comes from empirical research using stated-preference techniques to determine the value of travel time savings in the Netherlands as well as from the Paris-Brussels-Amsterdam high-speed rails evaluation study carried out by the European Commission.

Radiant Effect

In the User Approach, this aspect is associated with the relocation of household address. The absence of public transport is likely to induce people in the long term to live nearer to their work address and to reduce the number of trips and passenger kilometers traveled. This effect will have an impact particularly on those people who do not own a car and those who do not wish to use their car when public transport is a good alternative.

Conclusions from Phase 2

The search for greater efficiency in the Netherlands leads to increased urgency to know the economic worth of the public transport system or, as a corollary, the effect that eliminating public transport will have on the national economy. This is an important question that has been raised, and the benefits are often presumed rather than quantified. Instead of a general description of the effects using qualitative analysis or relying on tables with scores (using rating-points or plus and minus signs), the NEI study has put forward a coherent method for integrated estimations of the economic effects based on the Sector and the User Approaches.

In terms of practicality, the consultant concluded that radiant effects are difficult to isolate. Firm theoretical understanding of the dynamics of interactions between transport and land use is lacking. Another prerequisite is ready availability of comprehensive and quality data on traffic, transport, and land use. To minimize the danger of including spurious claims and to avoid possible double counting, it was agreed that the radiant effects would not be included in the calculations. However, as soon as the required knowledge is available, it should be incorporated.

For performance assessment, NEI recommended that gross value added at factor costs based on the Sector Approach and monetized values calculated for each of the economic effects in the User Approach should be added up and the totals compared respectively with the cost of the public transport program. However, the results from the two approaches should not be added together. The steering group endorsed the recommendation and agreed that the methodology should be tested in real-life situations.

PHASE 3: APPLICATION OF EVALUATION METHODOLOGY

First Stage: Total Public Transport Budget

The first stage is to apply the methodology to estimate the contributions of the public transport program to the national economy. According to the Sector Approach, public transport in 1990 contributed over 5.8 million guilders to the national economy (Table 1) in the form of gross value added at factor costs and was responsible for providing some 66,000 jobs. The largest share of these economic achievements had a permanent character, accounting for 86

TABLE 1 Economic Significance of Public Transport Based on Sector Approach, 1990

The sectors	Gross Value Added (at factor costs) (in million guilders)	Employment (in man years)
Temporary Effects		
- Construction sector	322	4,885
- Transport supply industries	148	2,475
- Intermediary delivery to construction	263	3,320
- Intermediary delivery to suppliers	102	1,410
Subtotal	835	12,090
Permanent Effects		
- railways sector	4,010	43,700
- intermediary delivery to PT	960	10,125
Subtotal	4,970	53,825
Total Effects	5,805	65,915

percent of all gross value added and 80 percent of employment. In the User Approach, with the most recently available sets of data, the economic cost of doing away with public transport amounted to 6.6 million guilders in 1991 (Table 2). In another words, the society had to pay for substantial increases in travel costs and for deteriorations in traffic safety in the without-public-transport situation in order to sustain the same level of mobility in pursuit of their regular economic and social activities.

The monetized values calculated by either of the two approaches were significantly higher than what the government had spent in public transport financing. This provides a first approximation of the economic worth of public transport in general.

Second Stage: Rail 21 Project

In the second stage, the methodology is applied to the Rail 21 project. In the calculations, it is assumed that the SVV-2 policy measures would be enacted and the Rail 21 proposals would be financed by the central government. Required infrastructures and planned service improvements (as foreseen by NS in its strategic marketing plan) would be implemented. Capacity of the network would increase and quality of services would improve significantly leading to increases in railway patronage. The Economic significance of the Rail 21 package is estimated using the Sector and the User Approaches.

In the Sector Approach, based on the value added multipliers and employment multipliers, the likely contributions of Rail 21 for 2010 are estimated. Allowances have been made for changes in the level of fares envisaged by NS and for known changes in labor and capital productivity between 1993 and 2010. The temporary and permanent effects resulted from the realization of Rail 21 are estimated to contribute 2.35 million guilders in gross values added at factor cost and almost 22,000 jobs per year throughout the study period.

The User Approach is based on the scenario of what would have happened if the Rail 21 project had been fully implemented and then assumed to disappear subsequently overnight. Calculations are made on the basis of a direct comparison in the composition of traffic and the intensity of use for different transport modes in the situations with and without Rail 21. Extra traffic generated by both existing and new rail passengers would have to be assigned to alternative transport modes. The contribution of Rail 21 is the difference in the overall economic effects. The economic value is estimated to

TABLE 2 Economic Significance of Public Transport Based on User Approach, 1991

Effects	Monetary values (in million guilders)
Journey Time	- 700
Travel Costs	5,509
Air Pollution	99
Noise	- 61
Traffic Safety	1,510
Efficiency of Business Trips	241
Total	6,598

be about 2.6 million guilders per year, associated largely with increases in journey time, travel costs, and accidents.

Conclusions from Phase 3

The results suggest that use of this methodology allows the estimation of the economic significance of the total public transport program as well as major subprograms as exemplified by the Rail 21 project. However, because of its exploratory nature, the results from Phase 3 should be interpreted with caution. The emphasis is on the efficacy of the evaluation methodology and less on exact precision of the calculations. This is because the outcomes are dependent on validity of the simplifications and accuracy of the assumptions. The steering group is of the opinion that the conceptual framework is functional and that the methodology gives a reasonably good indication of the direction of change. Without excessive demands on data, the NEI model is able to give the rough order of magnitude of various economic effects. Admittedly, the methodology still leaves much ground for improvement and refinements; what matters is that a systematic method in its embryo form has been developed.

GENERAL CONCLUSIONS AND RECOMMENDATIONS

1. The conceptual framework developed in Phase 2 provides a thinking model to evaluate the economic significance of public transport finance. The evaluation methodology offers a practical means to quantify and monetize the different economic effects such that a formalized procedure can be adopted for an integrated estimation of the economic effects. Total effects can then be compared with incurred costs to give a general indication of the economic contribution. It has been applied successfully to two real-life situations: the total public transport program and the Rail 21 subprogram. The experience suggest that the evaluation results should not be taken as the final word on the absolute value of public transport finance. But, when the methodology is used with intelligence and understanding of its strengths and weaknesses, it can serve as a suitable tool to assist decision making.

2. The outcomes of the two approaches should not be added together because the theoretical foundation and the philosophical perspectives are quite different. They represent two ways of viewing the same problem. However, when the results are laid side by side, the similarities in the rough order of magnitude reinforce one another. It is reasonable to conclude that the methodology provides a rough guide to the economic worth of expenditure on a public

transport program even though the estimates are tentative and the order of magnitude indicative.

3. The results should not be used uncritically. For an intelligent use of the instrument, it is particularly important to make explicit the underlying assumptions used and to make transparent the structural equations deployed in the model. These can be scrutinized and, if necessary, changed in the light of better information or new insights from future research.

4. Existing valuation and transformation tables have been constructed on the basis of empirical findings, research results, conventional wisdom, accepted practices, and educated guesses. They are deemed plausible working assumptions; however, there are also reservations on several sensitive policy areas. A list of observations follows.

—A crucial assumption is the gross simplification that the elimination of public transport will not lead to a reduction in the total number of trips but only a switch to other forms of transport. It is not realistic, but it provides the first stage of developing a thinking model.

—Future technical progress is hard to predict, but new technology can and will have significant impacts on noise, pollution, speed, and traffic safety; for example, electronic road guidance systems will affect road safety, save energy, and reduce air pollution.

—The government is not the only provider of funds for the provision of public transport. To assume that all of the effects are related to government spending is an overestimation. Moreover, a viable public transport network might be able to survive with services provided on commercial grounds in areas where there is a high density of population and where movements are concentrated in particular corridors. The practical difficulty is to define such a commercial network in the absence of knowledge about the business inclinations of the entrepreneurs.

5. Several important areas are suspected to be sources of underestimation, and a few examples follow.

—For congestion, it is assumed that the displaced passengers will be evenly distributed spatially, hence the effect will not concentrate on particular corridors or/and during particular times of the day. Because the average speed of the car is faster than that of public transport, the traveling public as a whole actually benefits from reductions in journey time as a consequence of eliminating public transport. This is a gross simplification that has been made for reasons of expediency (lack of detailed knowledge at the link level). In practice, it is commonly recognized that on particular sections of the motorway (e.g. along the Utrecht–The Hague axis), there is already substantial congestion and further increase will only lead to a complete standstill.

—Only changes in variable car costs are included. Fixed costs such as the cost of buying a car and paying for the road license fee are not included. The model assumes that passengers will switch to cars that are already there. Realistic estimation of the costs of car ownership or the imputed cost of leasing a car for private use will provide a better comparison.

—Although the radiant effects have been expounded to be important, such items have been excluded because of lack of knowledge. This is an important omission if the aim of the exercise is to evaluate the long-term impacts of major policy changes or to assess the economic significance of large-scale transport programs. Advances in dynamic transportation/land use modeling would contribute valuable insights into the process of structural changes, and efforts should be made to further the capability of the methodology.

—At present, the transport program is considered in isolation. It is possible that the public transport program has been conceived as part of an overall strategy to regenerate the economy. The combined forces of a mix of policy measures reinforced by carefully chosen projects can generate more effects than separate projects undertaken on their own.

—The public transport program may be designed to have a supporting role to ensure the success of the regional policy or to fight unemployment in a local district with redistribution as a stated policy goal. The existing methodology makes no allowance for such considerations.

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