

Evaluation of Economic and Development Impacts of Major Transit Investments

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Policymakers incorporate information on economic and development impacts in their evaluation of major transit investment alternatives, and there are good reasons for doing so. The information they use, however, is rarely suitable for evaluation. Deficiencies range from highly formal and detailed multiplier analyses that answer the wrong questions to highly heuristic arguments that cannot distinguish one alternative from another. Claims regarding jobs, property values, and urban form, for example, are often spurious. Transportation planners tend to underestimate both the importance of economic and development impacts and the difficulties in evaluating them. The task is to formulate the empirical questions to focus on potential real benefits and to estimate the magnitude of the benefits in the specific case. Precise answers will never be obtained, but at least the analysis can be directed to the applicable concepts.

Economic and development (E&D) impacts are a subset of the indirect effects of major transit investments. Direct effects are (a) the land, labor, materials, etc., acquired to construct and operate the system and (b) the passenger travel that takes place on the system. These direct effects then result in several kinds of indirect effects. Indirect economic impacts include employment, income, occupation, investment, retail sales, and other changes in private market activities. Development impacts are the physical and spatial effects--also called land use impacts (1)--brought about by the construction and operation of the transit system. Other indirect effects include environmental and social impacts. Analysis of E&D impacts can be separated into two parts:

1. What will happen? The positive side of the problem comes in establishing the empirical relationship between the transportation investment and the related impacts. Of particular concern to the federal granting agencies are the necessary conditions under which predicted impacts will occur and the assurance that public actions will lead to those conditions.

2. Which is better? The normative side of the problem is in choosing among transportation alternatives on the basis of E&D impacts as well as travel benefits and costs, i.e., the evaluation of E&D impacts (2).

Although E&D impacts are of significant concern for many kinds of transportation investments, the scope of this paper is limited to transit facilities that have fixed guideways. These include heavy-rail and light-rail systems, downtown people movers, and busways, usually in large urban areas. The lines of reasoning described, however, should apply to any urban passenger mode of transportation.

RATIONALE FOR CONSIDERING E&D IMPACTS

Much analysis of E&D impacts has been generated without thought to the proper questions. To learn that an expenditure of \$2 billion will create more jobs than an expenditure of zero dollars (all other things being equal) does not require any analysis at all. Several questions of more pertinence to evaluation are whether the given expenditure will create more jobs, more total income, or a more-equal distribution of income than another equal expenditure. These kinds of questions are both harder to ask and harder to answer.

Whereas theory and methods could be discussed at some length, the best way to motivate interest in the topics is to take some of the claims made for E&D benefits and see what would be needed to evaluate them. The arguments listed below include many that have been used in proposing new transit systems or extensions and a few that have not. All the arguments are valid under suitable conditions and not valid under other conditions, so evaluation of the arguments will depend on empirical information regarding whether the suitable conditions apply to the specific case. Examples will be offered, but no attempt is made to judge the correctness of past or proposed transit projects. The object is to outline the rationale for including E&D impacts in the overall analysis of the investment's worth.

Because of their indirect nature, E&D benefits should not be used as a substitute for travel benefits. In other words, if a project cannot be justified on the grounds of travel, it should not be treated as a transportation project. When travel projections are dependent on land use changes that are a consequence of the transit investment, clear documentation of the positive portion of the impact question (what will happen) is essential, even if no economic or land use benefits are claimed. The most important potential role for E&D benefits is probably in the justification of the incremental costs of a heavy capital investment (such as rail) over a lower capital alternative.

REVITALIZE URBAN AREAS

One of the more popular rationales, the use of public investments to revitalize sections of central cities, has been in use for several decades under various labels. The intent is to transform an area that has become blighted or depressed into one that is economically sound and self-sufficient. Redevelopment and rehabilitation are the main mechanisms, and public-sector actions are designed to stimulate private investment. Other related objectives include the improvement of urban neighborhoods, reduction of crime and vandalism, encouragement of owner investment and maintenance, reduction of unemployment, and the fuller use of the excess capacity in public facilities.

Urban revitalization, assuming that it can be successfully accomplished, can be judged from several perspectives. The federal government may be concerned with whether a transit investment in Boston will result in more urban revitalization than an equal investment would in Cleveland. Or the relevant question may be whether a transit investment would result in more revitalization in Cleveland than a highway or an urban-renewal investment would in the same city. The Urban Mass Transportation Administration (UMTA) may be interested mainly in whether a heavy-rail investment would do more revitalization than would a light-rail investment in the same city. The suburban taxpayer may question whether the investment in the central city creates more jobs than would a private investment in the suburbs. Any or all of these perspectives may help illuminate the choice between one alternative and another.

Rebuild Central Cities

To the extent that an urban revitalization effort stimulates private investment in the central city, some of this investment would already have taken place elsewhere in the region; thus the result is an intraregional transfer. The evaluation question is why the investment is better in the central area than elsewhere. One argument is that a public infrastructure would not have to be built if existing excess capacity within the central area is used rather than new areas on the fringes. In Detroit, it has been acknowledged that there is excess capacity in the suburbs as well (3), so this factor did not contribute to the revitalization benefits of the proposed light-rail system. Another argument is that low-income groups and minorities will benefit, which will result in an improvement in distributional equity.

Even though the investment shift is an intraregional transfer, the claim can be advanced that coordination of the investment will create greater net benefits. In Detroit, for example, the minor loss of investment to the suburbs will (purportedly) be offset by large gains to the central city, and the suburban losses are not in absolute terms but in a lower rate of growth. Thus, much can be gained at little cost. Demonstrating the plausibility of this assertion calls for comparisons of multipliers, markets for land uses in different locations, synergistic development effects, etc., that show central cities to be more socially productive investments than suburbs.

Stimulate Private Investment

Ever since the concept of urban renewal was initiated, it has been found that public investment does not always (and perhaps seldom does) stimulate private investment. Either no private investment may take place or the same private investment would have taken place in the same manner without the public investment. It may never be possible to identify the exact amount of private investment induced by any particular public investment, but at least we currently have a reasonably good idea of how projects can be undertaken jointly and benefit both public and private sectors.

Evaluation of the leveraging effects of public-sector investments depends heavily on market assessment and documentation of the entrepreneurial activities being undertaken by the public sector. Methods for market analysis showed, for example, that a light-rail investment in Detroit's Woodward corridor would have a greater stimulus on private investment than in any other corridor within the city (3). Induced private investment in the form of improved maintenance and upgrading of homes and stores may stem from the presence of a new transit facility, from reduced street congestion within the neighborhood, from additional services and neighborhood amenities, or from the redevelopment of key blighted parcels. How much of a public-sector effort is needed to tip the balance in favor of increased private investment can be a subtle assessment that calls for solid market information plus informed expert judgment.

STRENGTHEN LOCAL ECONOMY

Any expenditure will have direct effects (purchase of labor and materials, land, etc.) and multiplier effects (direct recipients of the expenditure will spend their income on other labor and materials). The more open (generally smaller) the local economy is, the greater is the tendency for leakage (propen-

sity to spend outside the region) and the lower is the multiplier (4,5). As when a rock is thrown into a pond, there are a splash and some ripples.

If a worthwhile evaluation question regarding these direct and indirect effects can be found, it is in the nature of whether one kind of expenditure creates more beneficial ripples than another. For example, attention might be given to whether a transit investment will create more jobs than an equal expenditure by the private sector in the same community would. Different results may be obtained for the number of new jobs, the total amount of labor income, and the number of jobs for previously unemployed residents. Contrary to the usual consensus among analysts, it is easier to estimate gross effects of major expenditures than differences between types of expenditures. It is practically impossible to determine whether a heavy-rail system creates more income than a light-rail system of equal nonlocal investment does. Ultimately, the answer hinges on which system serves the local economy most efficiently, and multiplier analysis can only weed out those that are obviously of no value.

Improved access benefits business (as it does to almost everyone), but these benefits must be weighed against the costs. Even if the costs are indirect (e.g., through property taxes) or only opportunity costs (a different expenditure would create more benefits), more access does not necessarily stimulate the economy. Moreover, access benefits are reflected in travel, and claiming additional benefits for access is double counting. Increased retail sales could indicate a stronger economy, but (as with too many indirect effects) net gains (as distinct from the spatial redistribution of sales) can only be established by reference to the overall efficiency of the transportation alternative. The question of global efficiency is among the most difficult to answer.

Better Use of Local Resources

Factors of production can be grouped into those of labor, capital, land, materials, and entrepreneurship. Those factors in scarce supply must be economized, and those with which the region is relatively well endowed should be turned to advantage. A transit system that helps reduce the spatial separation between workers and the most suitable jobs improves use of the local labor pool. Stimulation of demand for sectors that show excess capacity improves use of capital. Planned development and reduction of energy use in passenger transportation may release more petroleum for other purposes. Often overlooked, the encouragement and effective use of scarce entrepreneurial talent may be the most productive way to strengthen a local economy.

If transit investment can have an impact on making better use of scarce resources, it will take place in the details of the planning and implementation of the transit project (6). Station locations that provide the best opportunity for joint development, station-access designs that preserve neighborhood amenities, and alignments that provide the best service in the long run rather than simply show the lowest public expenditure are some of the microscopical decisions that will determine whether the net effects on use of resources are positive or negative.

Reduce Unemployment

An expenditure of federal funds in an urban area will not reduce unemployment there if (a) the local unemployed have no skills applicable to the contemplated projects, (b) most of the workers are hired

from outside the region, (c) there are discriminatory barriers to hiring the unemployed, or (d) the work can be highly automated (7). Even if the pool of unemployed can be clearly matched to the demand for labor generated by the federal expenditure, the reduction in unemployment might be less than if (a) the expenditure were made in the private sector, (b) the expenditure were made on some other transportation project, or (c) the expenditure were made in another city. The existence of a pool of unemployed workers does not imply that there will be any employment benefits emanating from a transit project.

When it can be assumed that some similar federal expenditure would have been made in the region under any likely circumstances, employment effects are mostly intraregional transfers. If the expenditure would have occurred in another city, then the effects are interregional transfers. The applicant for federal funds should address the question of the effectiveness with which the expenditures will reduce unemployment in the local region relative to other local (including private-sector) expenditures.

Expand Tax Base

A transit investment that creates net benefits to a region will inevitably increase the tax base of the region. Unfortunately, there is no reliable way to establish the quantitative magnitude of any net benefits. Most of the analysis that can be done with respect to tax bases (property, sales, and income) measures shifts in the location and in the components of the tax base. A transit investment that causes property values to increase in one community will increase that community's property-tax base, but this is likely to be at least partly at the expense of some other community in the region. The same will be true for sales taxes and perhaps for income taxes. The transit system itself, of course, subtracts from the property-tax base in that it removes land from tax rolls, although it may remove less land than would a highway of equal capacity.

Because quantitative estimates of net gains (or losses) to the tax base are so unreliable, analysis is better directed at the equity impacts. Tax rates in communities that gain or lose taxable property or activities will be affected, and the intraregional redistribution of the tax burden may be favorable or unfavorable.

Enhance Regional Advantage

A plausible hypothesis regarding the San Francisco Bay Area is that the city needed a high-capacity and high-quality commuter transit network in order to maintain its comparative advantage as a West Coast financial center (8). Bay Area Rapid Transit (BART) provided the necessary complement to the region's already established natural advantage. From the standpoint of the country as a whole, enhancing the special characteristics of San Francisco adds strength to the national economy. None of these assertions can be tested empirically, and there is little reason to waste time and effort in doing so. Certain aspects, however, can be documented, which lends somewhat greater (or less) credence to the arguments. Market Street and San Francisco's financial district added large amounts of high-rise office space during and after the construction of BART (9), and surveys of ridership suggest that an expanded freeway-automobile mode could not have served the current high-intensity use of land without destroying the city. There are those who decry this "Manhattanization" of San Francisco, but, be that as it may, BART was almost certainly a necessary ingredient. Whether an express-bus system

could have done just as well is a harder question to answer.

An alternative approach to strengthening the local economy is to diversify into sectors that are less sensitive to cyclical swings, or faster-growing, or more complementary to existing sectors. Transit investment might serve this objective by supporting office employment in a manufacturing region (10) or by supporting urban life-styles that would not exist without special or high-capacity transit modes. Many factors must be brought together to induce these effects, but transit may be an essential component.

PROMOTE EFFICIENT DEVELOPMENT

Some planners have long subscribed to the notion that fixed-guideway transit can shape development patterns, which give form to the metropolitan area. There may be considerable truth in this, but recent impact studies have found the detectable effect to be small in the short run in the U.S. cities (11-15). The reasons for this are numerous, but two of the most important are (a) the universal availability of highway modes of travel (which forces the new system to compete for travelers in a market already supplied with substitutes) and (b) the absence of local land use policies that would lead to altered development patterns (16).

Although it is rarely acknowledged, the argument that favors transit investments as a means for affected regional development patterns must be made largely on second-best grounds. Urban sprawl is the result of underpriced highway and other public infrastructure services (17), and these public costs can be reduced by encouraging transit-oriented modes of development. Environmental quality can be more easily protected by using clustered development rather than by uniform low-density development or unplanned sprawl. A high-density urban core (which would occur naturally under the best conditions) can be built with the aid of a major transit investment. These arguments have merit, but they are extremely hard to substantiate.

Reduce Sprawl

It is easier to explain the causes of sprawl than to measure the inefficiencies, although we have some idea of the types of costs involved (18). The most easily measured factors are those of transportation, urban services, sewer, water, utilities, and fire protection. Social services may also be cheaper on a per-customer basis, and multifamily housing is cheaper to construct per unit. If other factors are held constant, the costs of these inputs increase for either unplanned development or low-density development.

Presumably, however, there are benefits to the individual from low-density sprawl; otherwise, the market would offer something else. These benefits might be more space, fewer restrictions on the use of land, or greater physical segregation. The second-best rationale for countering the tendency toward sprawl is that these individual benefits (if we can describe them) are purchased at too low a price because of government subsidy. The prices cannot be easily corrected, but a counterbalancing effect can be achieved by subsidizing high-quality rail transit. Unfortunately (as may have been the case with BART), transit can serve to increase sprawl if the underlying incentives are left untouched.

Permit Complex Integrated Development

A major transit investment may create an opportunity

for mixed-use development that would not have occurred without the transit investment. As is now well known, complex development of this type will not happen automatically just because a rail transit station appears, but the opportunity may be there. Taking advantage of the opportunity requires supportive transportation and land use policies as well as active joint-development efforts under favorable market conditions (19,20).

The main reason for the substantial amount of effort necessary to produce transit-oriented land use adaptations in this country is the general ambivalence of public policy toward passenger modes. In the last three decades, there are probably no instances in which fixed-guideway transit was constructed in an area not adequately served by highways. Much of the extensive BART system was built at the same time that suburban freeways were built; often the rail tracks were in the median of the freeway. In contrast, as observed by Michael Goldberg of the University of British Columbia, rail extensions in Toronto may have had such apparently strong land use effects because the actors involved knew that suburban freeways would not be built.

The benefits that can be cited for integrated mixed-use development are the magnetic effect for attracting related private investment, the reduced requirements for access and parking at stations, the improved utilization of the transit system, opportunities for urban design and public amenities not otherwise available, agglomeration economies in retailing, removal of barriers in the form of fragmented land ownership, and the provision of housing for low- or moderate-income families or for the elderly. These are only opportunities for improved land use development, and they may be found in suburban as well as central-city locations, but they are frequently opportunities that can only be achieved by joint development in conjunction with high-capacity transit modes (21).

Evaluation depends most heavily on assessing whether market conditions and public actions are sufficient (and necessary) to lead to the development results anticipated. As distinct from urban revitalization, integrated development involves making best use of market forces rather than attempting to turn them around. Hence, a much larger share of the investment in the revitalization setting will need to be public investment. Joint development in an area that is not blighted should depend primarily on the private sector for capital, and there should be suitable integration and controls initiated by the public sector.

IMPROVE DISTRIBUTIONAL EQUITY

Many of the reasons--both explicit and implicit--for investing in major transit systems are to help low-income and minority individuals and families, but such results are far from automatic. Construction jobs are transitory and may go to interregional migrants before local unemployed are absorbed. Effects of minority contracting may be very superficial. Neighborhood revitalization may do nothing for the residents if they are renters rather than owners. Redistributing income-in-kind through transit projects may be the most effective mechanism that is politically feasible, but care must be taken to see that (a) the ostensible beneficiaries do in fact receive the benefits and (b) the transportation purposes of the investment are not seriously compromised. If (b) cannot be satisfied, there are generally much better ways to redistribute income than indirect economic impacts of transit investment.

Negative externalities in the form of air and water pollution, noise, danger, visual intrusion,

and the like create real costs for society and the individuals who suffer them, even though there may be no apparent expenditures by the victims. An impacted property, for example, may depreciate in real dollars. Equity urges that either increases in negative externalities be mitigated or the recipients be compensated by the purchase of property rights. A transit investment may reduce externalities in some locations (an indirect benefit) and increase them in others. Careful analysis can identify the likely gainers and losers and suggest corrections for any adverse redistributive impacts.

OTHER INDIRECT BENEFITS TO LOCAL COMMUNITY

Running a transit system underground is enormously costly in an urban area, but it results in substantial benefits. One is the saving in land on the surface, which can be put to other uses. This saving is reflected, at least in part, in the lower land cost for constructing the transit line. Another benefit is the amenity to nonusers of having the transportation facility underground and out of sight and hearing. When the residents of Berkeley voted an additional tax on themselves to place part of BART fully underground, they were placing a value on these benefits.

A major transit investment may serve such elusive qualities as neighborhood cohesiveness or civic pride (as BART did during the early stages of construction) or regional image (employers may prefer an area that has a modern rail-transit system). Effects of this sort are not measurable (or are at least unpredictable), and anyway they should show up in other forms if they truly exist.

NEGATIVE IMPACTS

Where it is possible to have positive impacts, it is also possible to have negative impacts. An investment alternative may reduce the housing stock (by direct or indirect demolition of dwellings), increase inflation (by straining limited local labor and capital resources), destroy neighborhoods (through parking demand, station-access congestion, or stimulation of encroaching development), and create visual degradation. BART-related redevelopment of the Mission and Rockridge neighborhoods has been stymied by fears of displacement and incompatible development, and parking demand has generated problems in Daly City. Reduction in noise and air pollution in one location may be offset by increases at other locations. Pressures for higher-intensity mixed land uses will result in conflicts and negative spillovers unless the transition is sensitively handled. Making intelligent choices among alternatives means correcting or minimizing the negative impacts and carefully designing to maximize the positive impacts.

CONCLUSIONS

A range of arguments has been presented for including indirect economic and development impacts in the evaluation of major transit investment alternatives. Suggestions were made for assessing whether each argument was valid in the specific case and for generating the empirical estimates of any benefits that arise from E&D impacts. Most of the rationales offered above are elusive in quality, and quantitative estimates of benefits are likely to be very imprecise (22). Reasonability checks, consistency with regional forecasts, and market analysis will be more helpful than complex quantitative models. We urge that attention be given to the application of sound concepts and appropriate empirical methods

rather than to refined analyses of largely unimportant numbers. Revitalization of urban areas, more-efficient patterns of land use, and favorable redistribution of income are potential consequences of transit investment, but these impacts will occur only under nearly ideal conditions. Actions taken on the part of all the levels of government involved in a transit investment will have a greater effect on the outcome than will efforts to predict scientifically the exact impacts of each alternative investment, but careful analysis is still required.

REFERENCES

1. L.L. Trygg and A. Sgourakis. Land Use Impacts of Rapid Transit. Council of Planning Librarians, Chicago, IL, CPL Exchange Bibliography 1377, 1977.
2. H.S. Cohen. Evaluating Urban Transportation Systems Alternatives. System Design Concepts, Washington, DC, 1978.
3. Southeastern Michigan Transportation Authority. Public Transportation Alternatives Analysis. UMTA, U.S. Department of Transportation, Oct. 1979.
4. S. Pleeter, ed. Economic Impact Analysis: Methodology and Applications. Martinus Nijhoff, Boston, MA, 1980.
5. H.W. Richardson. Regional Economics. Univ. of Illinois Press, Urbana, 1979.
6. R. Witherspoon. Transit and Urban Economic Development. Practicing Planner, Vol. 9, No. 1, March 1979, pp. 31-35.
7. T. Muller. Economic Impacts of Land Development: Employment, Housing, and Property Values. Urban Institute, Washington, DC, 1976.
8. R. Grefe and others. The Impact of BART on the Competitive Advantage and Efficiency of Bay Area Business Operations. U.S. Department of Transportation; U.S. Department of Housing and Urban Development, 1977.
9. D. Wiech. Market Street Study--Pre-BART Studies of Land Use and Investment. Metropolitan Transportation Commission, Berkeley, CA, June 1973.
10. C.A. Gannon and M.J. Dear. Rapid Transit and Office Development. Traffic Quarterly, Vol. 29, No. 2, April 1975, pp. 223-242.
11. D. Boyce and others. Impact of Rapid Transit on Suburban Residential Property Values and Land Development. U.S. Department of Transportation, 1972.
12. G.W. Davies. The Effect of a Subway on the Spatial Distribution of Population. Journal of Transport Economics and Policy, Vol. 10, No. 2, May 1976, pp. 126-136.
13. D.N. Dewees. The Impact of Urban Transportation Investment on Land Value. Univ. of Toronto-York Univ. Joint Program in Transportation, Toronto, Canada, 1973.
14. D.M. Dornbusch. BART-Induced Changes in Property Values and Rents. David M. Dornbusch and Co., San Francisco; Metropolitan Transportation Commission, Berkeley, CA, 1974.
15. N. Glickman, ed. The Urban Impacts of Federal Policies. Johns Hopkins Univ. Press, Baltimore, MD, 1980.
16. R.L. Knight and L.L. Trygg. Land Use Impacts of Rapid Transit: Implications and Recent Experience. U.S. Department of Transportation, 1977.
17. P.B. Downing, ed. Local Service Pricing Policies and Their Effect on Urban Spatial Structure. Univ. of British Columbia, Vancouver, BC, 1977.
18. Real Estate Research Corporation. The Costs of Sprawl: Detailed Cost Analysis. U.S. Department of Housing and Urban Development; U.S. Environmental Protection Agency, 1974.
19. Administration and Management Research Associates of New York City, Inc. Transit Station Area Joint Development Strategies for Implementation: Economic Case Studies. UMTA, U.S. Department of Transportation, 1976.
20. D.B. Lee. How to Do a Transit Station Land Use Impact Study. TRB, Transportation Research Record 677, 1978, pp. 28-33.
21. Joint Development. Urban Land Institute, Washington, DC, 1979.
22. J.A. Gomez-Ibanez. Transportation Policy and Urban Land Use Control. Department of City and Regional Planning, Harvard Univ., Cambridge, MA, Discussion Paper D75-10, Nov. 1975.

Lessons from an Economic Analysis of an Intercity Road in a Hypothetical Developing Country

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An economic analysis of a proposed intercity road in a developing country is presented. The case is hypothetical, but the data have been selected to be representative of several real-world nations. This analysis extends current efforts by considering pricing adjustments, including inflation, shadow-price premiums, and utility premiums. Results then are judged on the basis of seven economic indicators for three sets of conditions: (a) variations in inputs, (b) inclusion (or exclusion) of different pricing adjustments, and (c) alternative projects. The results lead to lessons for economic analysis, some of which have never been expressed before.

Part of a World Bank project to develop a set of guidelines for highway-project appraisal for train-

ing purposes involved creation of a hypothetical case study. This was intended to describe the joint use of many of the procedures currently in practice or proposed for the economic analysis of intercity road projects in developing countries. To my knowledge, these procedures have never been totally employed in any real-world project, so that a sample application, although hypothetical, might prove to have some useful lessons for both technicians and decision makers. It should also be noted that, although the example is hypothetical, the data are considered to be representative of conditions in