A Benefit Transfer Approach to Evaluate Livability Benefits of Transit Projects in Benefit-Cost Analysis

Kate Ko
HDR | Decision Economics
&
University of Minnesota, Department of Applied Economics
Email: kate.ko@hdrinc.com
Phone: 240-485-2626
Fax: 240-485-2635

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ABSTRACT

The United States Department of Transportation (USDOT) is seeking to refine guidance to states and localities on Benefit Cost Analyses (BCA) methods. The purpose of the request is to improve the quality and consistency of transportation grant applications received by the Department, most recently under the Transportation Investment Generating Economic Recovery (TIGER) program. One of the heated topics regarding BCA methods is the estimation of livability benefits. Economics practice has favored the estimation of these benefits through analyzing changes in property values, as this provides value capture evidence for policy makers to justify the investment. In particular this approach suggests the value of all the amenities generated by a transit project may be capitalized in the increased value of nearby properties, which after the improvement are located in place that is more ‘livable.’ This research connects consumer demand and value of livability through benefit transfer of existing hedonic studies of transit investment. In particular it lays out the steps to which livability benefits can be assessed. The importance of this work derives in part from the large effect that livability benefits can have on the benefit-cost evaluation of transit projects.
INTRODUCTION

The United States Department of Transportation (USDOT) is seeking to refine guidance to states and localities on Benefit-Cost Analyses (BCA) methods. The purpose of the request is to help improve the quality and consistency of transportation grant applications received by the Department, under various funding allocation processes—most recent one being the Transportation Investment Generating Economic Recovery (TIGER) program.

Under the Notice of Funding Availability (NOFA) (1) for TIGER grant, applicants are required to conduct a Benefit-Cost Analysis (BCA) for the proposed projects as part of their applications. The analysis is a conceptual framework that quantifies in monetary terms as many of the costs and benefits of a project as possible. Benefits are broadly defined. They represent the extent to which people impacted by the project are made better-off, as measured by their own willingness to pay (WTP). In other words, central to BCA is the idea that people are best able to judge what is "good" for them, what improves their well-being or welfare. The analysis also adopts the view that a net increase in welfare (as measured by the summation of individual welfare changes) is a good thing, even if some groups within society are made worse-off. A project or proposal would be rated positively if the benefits to some are large enough to compensate the losses of others. Typically BCA is a forward-looking exercise, seeking to anticipate the welfare impacts of a project or proposal over its entire life-cycle. Future welfare changes are weighted against today’s changes through discounting, which is meant to reflect society’s general preference for the present, as well as broader inter-generational concerns.

One of the heated topics regarding BCA methods for transit projects is the estimation of livability impacts as it involves assessing secondary impacts that are not perceived by travelers. Although secondary, livability impacts are by no means unimportant, especially from transit systems that provide service characteristics that are quite different from traditional modes such as bus and train. The United States Department of Housing and Urban Development (HUD) (2) states that households located in transit-oriented communities save an average of approximately $3,000 per year per household in auto-related costs as compared to households in auto-oriented areas. These savings are associated chiefly with the ability to walk to a wider range of destinations and, to a lesser extent, to transit access itself. People place a value on their assessment of the quality of life in their communities, which can include a sense of overall attractiveness of the physical place and a sense of community cohesiveness. These aspects are significantly influenced by individuals’ mobility to access amenities nearby as well as of the surrounding communities, such as shopping centers, theatres, sports and fitness centers, greenways, medical facilities, and schools.

Economics practice has favored the estimation of livability benefits through analyzing changes in property values from hedonic pricing of willingness to pay for proximity to transit stations, as this method also provide value capture evidence for policy makers and stakeholder parties to justify the investment. The use of hedonic pricing assumes that if a transit project reduces automobile-travel dependence and provides households access to amenities, it stimulates the demand for land and buildings located in the vicinity of station locations, and, other things being equal, raises property market values. Part of the increase in the value of the real estate market around station areas is associated with the transportation cost saving afforded by the investment, particularly if the investment generates time savings and/or the ability to reduce car ownership.

Measurement of non-users’ willingness to pay for, or pricing of access of, transit investment is well established in hedonic pricing literature. Compared to stated preference
methods which often comprised of contingent evaluation experiments or surveys, estimates from
hedonic pricing can be more readily applied as they are developed through a function of standard
elements. In the case of estimating WTP to pay for transit investment embedded in property
values, the modeling elements usually include structural, location, and regional aspects of
residential and commercial properties. Though the method of hedonic pricing may be standard, it
is the implementation of WTP estimates in BCA that is often questioned. Even in the
Transportation Cooperative Research Program (TCRP) guidebook for BCA recommended by the
USDOT (3) and the Office of Management and Budget’s (OMB) guidance on regulatory impact
analysis (4), there is no clear recommendation laid out for practitioners to incorporate property
premiums into BCA. Specifically, TCRP recommends applying a land use model that does not
even control for structural characterization of real estate development. The guidance provided by
OMB does not contain specific examples of how to conduct a benefit transfer rigorously. Neither
report discusses how WTP is a measure of welfare evaluation of price changes, nor if and how
the estimates can be applied in the temporal setting of a BCA.

The purpose of this paper is to propose a benefit transfer framework within BCA for
estimating livability benefits stemming from transportation investment. While the concept of
benefit transfer is not new and research on hedonic pricing of transportation projects are
abundant, the framework outlined in this study bridges the theory of consumer demand,
empirical findings in hedonic pricing studies, and the implementation of benefit transfer in BCA.
Other issues concerning BCA, such as benefits being double-counted and transferred (from one
area to another), while are not being analyzed in the proposed approach, are by no means
unimportant. A brief discussion of the steps involved to account for double counting for travel
time savings is provided in the concluding remarks.

LITERATURE REVIEW

In the context of welfare evaluation of price changes due to transit investment, the
welfare measure “compensating variation” (5) measures the net revenue (transportation grant or
subsidy) of a planner who must compensate the consumer for the price change (in property value)
after it occurs, so to bring him back to his original utility level. On the other hand, welfare
changes can be interpreted, using “equivalent variation”, as the amount of income required for
the consumer to have the same purchasing power as before. Either ways are correct measures of
welfare change, as long as price changes can be added to (or subtracted from) the consumer’s
budget. One way to do so is using a hedonic pricing function.

Hedonic pricing is developed through a series of studies on consumer demand (6, 7, 8, 9)
in which a pricing function enters a representative consumer’s utility maximization problem.
Most recently it has been developed for consumption of housing and a composite good (that
represent everything else but housing) to recover WTP for housing amenities (10, 11, 12).
Assuming that proximity to transportation investment is a location amenity of real estate
properties, many empirical studies have examined the impact of highway, commuter rail, light
rail, etc. on property values. Evidence of transit impacts on residential property values is well
established. Some researchers have started to include innovative elements into the estimation of
WTP. For instance there are few hedonic pricing applications that are non-stationary, in the sense
that spatial or temporal functional interdependence are taken into consideration. Can and
Megbolugbe (13) modify a spatial hedonic model to capture the spillover effect of sale of a home
by introducing a spatially autoregressive (SAR) term as an explanatory variable, using single-
family housing transactions for Dade County, Florida data in 1990. In this manner the prices of
the most recent sales of similar properties are considered in estimating the market value of a
property, controlling for differences in their structural attributes and neighborhood characteristics.
In comparing the SAR result to traditional hedonic regression, they find that the explanatory
power of the model increases by at least 14 percent. Following Can and Megbolugbe, Haider and
Miller (14) apply the same SAR technique in their analysis, but they first use Moran’s I
autocorrelation statistics to detect existence of spatial autocorrelation. Using freehold property in
Greater Toronto Area sold in 1995, they find that the SAR model improves the non-spatial model
by about 5.3 percent.

Due largely to data limitations, there are relatively few hedonic studies of transit impacts
on non-residential values. Ryan (15) provides a summary of the findings of seven studies, and
among them, a positive relationship is found in about half of the location-industry combinations;
Landis et al. (16) find a negative relationship between rail access and sales prices; and others
conclude no significant effect. Most studies published thereafter demonstrate a positive impact
of rail transit on property values (17, 18, 19, 20, and 21) whereas a few others find a negative
impact (22, 23, and 24). Overall, these studies produce mixed outcomes although a positive
impact is prevalent in more recent studies.

Empirical studies on benefit transfer or applications of hedonic pricing estimates are even
less prominent. Debrezion et al (25) provide a meta-analysis of the impact of rail stations on
effect sizes of proximity to stations on property from existing studies. Essentially they used
results from the literature as their data sample. Regressing estimated percentage in property
values on 0.25 mile station dummy variable, they found that the average effect size for the
impact of rail station proximity on property values was 25.7 percent. Boyle et al (26) provided
sited a number of empirical applications of benefit transfer outside of transportation economics,
but cautioned readers that the validity of the practice as there are deep data and econometric
issues in the meta-analysis regression. As discussed earlier, hedonic pricing studies in
transportation economics have become more sophisticated, and this may add to the econometric
difficulty and ultimately explains the lack of empirical studies.

DEFINITION(S) OF AND WILLINGNESS TO PAY FOR LIVABILITY

Livability refers to the subset of sustainability (optimized economic, social, and
environmental factors which also account for long term and indirect impacts) impacts that
directly affect people in a community, such as economic development, affordability, public
health, social equity and pollution exposure (27). As reported in TABLE 1, different
transportation agencies have different views or working definitions of livability. But overall in
the case of new transit investment, livability benefits due to a project can be viewed as the uplift
in land value which is created when the scope or intensity of development along the proposed
transit stations is increased. Thus WTP for liability is the amount people are willing to pay for
the synergy created by the spatial dependence of local economic activities, and is assumed, in
this study, to be capitalized in property prices through hedonic pricing functions. Formally, in
assessing the impact of a transit project on property values, a hedonic pricing function of
property price is a composed of structural, location, and neighborhood characteristics.

\[ p_i = f(L_i, T_i, S_i) \]  

where, \( L_i \) is the set of structural and location characteristics for the \( i \)th property; \( T_i \) is the set of
transportation network accessibility characteristics for the \( i \)th property; and \( S_i \) is the set of
socioeconomic characteristics for the \( i \)th property. The marginal WTP is then defined as the
change is property price with respect to a change in transportation network accessibility, \( dp/dT \).
Theoretically, hedonic pricing function is used to develop marginal bid curves to represent the
demand for each of the characteristics in $p_i$ (28). Together with the WTP definition (changes in
consumer indirect utility function with respect to changes in each of the variables included in the
hedonic pricing function) developed by Bajari et al (10, 11), the estimation of welfare change
brought about by a transportation investment is formalized and it aligns with the welfare
evaluation of price change in (5).

### TABLE 1 Selected Working Definitions and Implications of Livability in Transportation

<table>
<thead>
<tr>
<th>Agency/Organization</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Highway Administration (29)</td>
<td>Livability in transportation is about using the quality, location, and type of transportation facilities and services available to help achieve broader community goals such as access to good jobs, affordable housing, quality schools, and safe streets.</td>
</tr>
<tr>
<td>DOT Secretary LaHood (30)</td>
<td>Livability means being able to take your kids to school, go to work, see a doctor, drop by the grocery or post office, go out to dinner and a movie, and play with your kids at the park—all without having to get in your car.</td>
</tr>
<tr>
<td>AASHTO (31)</td>
<td>AASHTO’s ‘livability’ objective is to use transportation investments to improve the standard of living, the environment, and quality of life for all communities, rural, suburban, and urban.</td>
</tr>
<tr>
<td>USDOT, EPA, &amp;HUD (32)</td>
<td>Livability is guided by six principles: promote more transportation choices; promote, equitable, affordable housing; enhance economic competitiveness; support existing communities; coordinate and leverage federal policies and investment; and value communities and neighborhoods.</td>
</tr>
</tbody>
</table>

### BENEFIT TRANSFER APPROACH IN LIVABILITY EVALUATION IN BENEFIT COST ANALYSIS

As BCA is a forward-looking exercise, seeking to anticipate the welfare impacts of a project or proposal over its entire life-cycle, benefit transfer is essential to provide a proxy for the anticipated impact. There are varying degrees to which benefit transfer can be applied, depending upon the practitioner’s time and budget, and the robustness of the method used is often reflected in the results. For example in a transit BCA, when the estimated livability impact becomes so overwhelming that makes other benefits such as travel time savings seem almost insignificant, the validity of the benefit transfer and ultimately the BCA may be dubious. In reference to conducting regulatory impact analysis, the OMB (4) stresses that benefit transfer should be treated as a last-resort option as the approach of benefit transfer in general is inherently speculative. The approach provided in this study is by no means suitable or applicable to transit projects of all sizes and scopes. It is intended to introduce a systematic approach for estimating livability benefits in a BCA that can be refined and reproduced.

The transfer of benefits is a mechanical way to estimate potential impact of an action. The underlying assumption is that much like a mathematical equation, similar outcomes can be expected if and only if similar inputs used. This means that for a BCA, benefit transfer may be used when the study or target project share similar characteristics with the original or control project. Conversely, when a benefit transfer analysis reveals that two projects have similar
impacts, then the two projects are expected to have similar features. In particular in the OMB guidance (4) it is stated that study and policy projects with similar magnitude of imposed change should be similar in populations, market size, distribution of property rights, and availability of alternatives. That is to say, benefit transfers should not be used if the study and control projects are unique and are aimed to have to impose significantly different change. Further more, the OMB suggests that once benefit transfer is deemed appropriate for estimating the expected impact, a functional benefit transfer should be used in place of a single point benefit transfer.

In the case for WTP to livability, benefit transfer can either be single point or functional, depending on the chosen control studies of hedonic pricing. If \( p_t \) in equation (1) is linear additive in all its components, then single-point benefit transfer should be applied as marginal WTP, \( dp/dT \), is simply a scalar. Otherwise, functional benefit transfer should be used as \( dp/dT \) is a function. For example, Hess and Almeida (33) and Goetz et al (34) introduce an interaction term between proximity to transit and location such as \( dp/dT \) a step function as a result of location dummy variables being used. If continuous explanatory variables are used, then \( dp/dT \) is a continuous function. The use of functional benefit transfer requires that the entire hedonic pricing function to be employed, which means that new data for the variables used in the original function used must be available.

As for single point benefit transfer, the value of \( dp/dT \) must be weighted using scaling factors that define the characteristics of the study and control projects. The robustness of the transfer can improve when estimates of multiple control projects are employed and applied as an average. The following is a list of scaling factors that may be applied to the premiums found to apply single point value transfer. These factors should not duplicate those that are already used to derive the premiums in the first place, as this implies that there are interactions among the variables that had not been accounted previously.

**TABLE 2 List of Scaling Factors for Single Value Benefit Transfer**

<table>
<thead>
<tr>
<th>List of Potential Variables Used to Derived Benefit Transfer</th>
<th>Unit of Measure</th>
<th>Economic Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridership of System</td>
<td>• Boarding per Year</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Percentage Growth</td>
<td>• Demand of system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• A characterization of the transportation network as it can imply the availability of alternatives</td>
</tr>
<tr>
<td>Population of Study Area</td>
<td>• Unit</td>
<td>• Demand shifter</td>
</tr>
<tr>
<td></td>
<td>• Percentage Growth</td>
<td></td>
</tr>
<tr>
<td>Average Walking (Manhattan) Distance to Transit Station</td>
<td>• Meters</td>
<td>• Measures the maximum walking distance between a home and access to transit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Change in price of a home with respect to a chance in walking distance reflects the WTP for proximity to transit</td>
</tr>
<tr>
<td>Average Direct (Euclidean) Distance to Transit Alignment</td>
<td>• Meters</td>
<td>• Proximity to the line reflect the nuisance associated with the alignment in terms of pollution</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Travel Time to Central Business District</td>
<td>• Minutes • Proximity to employment center</td>
<td></td>
</tr>
<tr>
<td>Composite Sprawl Index</td>
<td>• [0,1] • Implication of automobile dependency</td>
<td></td>
</tr>
<tr>
<td>Land Use Mix- Various Indices</td>
<td>• [0,1] • Indicator of livability, community cohesiveness, and density</td>
<td></td>
</tr>
<tr>
<td>Cost Effectiveness of System</td>
<td>• Revenue Cost Ratio • Performance metric of system</td>
<td></td>
</tr>
<tr>
<td>Transit Oriented Development Implementation</td>
<td>• Dummy • Amount of Investment • Account for effects of subsidies and other incentives</td>
<td></td>
</tr>
<tr>
<td>Value Capture Implementation</td>
<td>• Dummy • Amount of Tax Collected • Account for effects of subsidies and other incentives</td>
<td></td>
</tr>
<tr>
<td>Number of Connections to Other Modes/ Systems</td>
<td>• Each • Reflects how integrated the system is to the region’s transportation network</td>
<td></td>
</tr>
<tr>
<td>Residential and Commercial Permits Issued</td>
<td>• Each • Account for non-user demand for amenities generated by the system</td>
<td></td>
</tr>
<tr>
<td>Amount of Funding from Private Developer</td>
<td>• Percentage of Total Project Cost • Account for supply for amenities generated by the system</td>
<td></td>
</tr>
<tr>
<td>Ease of System Access</td>
<td>• Dummy variables for park and ride; bike racks • Binary variable for staircase, escalators, and lifts • Degree to which the system and relevant facilities can be utilized</td>
<td></td>
</tr>
<tr>
<td>Changes in Travel Demand for Alternative Modes</td>
<td>• Percentage change in traffic count, trip-miles, number of automobiles owned per household- pre and post system operation • Reflection of diversion from other modes to the system • Account for changes to the area’s transportation network</td>
<td></td>
</tr>
<tr>
<td>Changes in Health and Safety of Residents</td>
<td>• Percentage change in medical spending • Changes in accident rates per vehicle mile traveled • Reflection of diversion from other modes to the system</td>
<td></td>
</tr>
<tr>
<td>Changes in Greenhouse Gas Emissions</td>
<td>• Percentage change in mole fractions (parts per million) in the atmosphere • Reflection of diversion from other modes to the system</td>
<td></td>
</tr>
<tr>
<td>Average Mortgage Period</td>
<td>• Years • Proxy for benefits amortization schedule</td>
<td></td>
</tr>
<tr>
<td>Property Types</td>
<td>• Separate benefit transfer estimates/ functions for single-family, multifamily, condominiums, and commercial properties • Separate of markets</td>
<td></td>
</tr>
<tr>
<td>Adjustment Factor of Double Counting Other Types of</td>
<td>• Percentage • Discounting of primary impact already included</td>
<td></td>
</tr>
</tbody>
</table>
EVALUATION METHODOLOGY AND APPROACH

As presented in the previous section, single point value transfer can be weighted using multiple factors, which importance depend upon the available data of the projects involved in the benefit transfer exercise. The following is an outline of a livability benefit calculations in a BCA using benefit transfer of WTP for livability, with procedures and steps aligning with guidance provided by the DOT and OMB. In the discussion to follow, it is assumed that there are five key components in estimating livability benefits: property number and growth rate, property value and growth rate, and transit premium rate. These components are key to driving the value of transportation as well as spatial connectedness of community amenities. The first four are derived through historic, current, and forecast (or planned) land use and property data for the impact area. These estimates are assumed to remain unchanged with or without transit. The last component, transit premium rate, or rate of increase in value due to the nearby transit, is applied through single value benefit transfer, based on estimates of historic impacts of transit on property values found in current literature. Since many studies rely on data after transit opening, this analysis only applies the transit premium rates to new properties after transit opening and not during construction. In this setting, a new property is one that is newly impacted by transit. All existing properties are considered new in the first year of transit operation, while only those that are newly constructed in subsequent years will be considered for the remaining lifecycle of the transit alignment.

For a new property near the transit alignment, its market price or rental rate at the time of purchase or lease is assumed to capture the expected lifecycle stream of benefits. The amount of transit premium is then realized by the property owner or lessee annually at an increasing rate to reflect growing certainty over time. As a result of these two assumptions, the estimated transit premium rate (as a percentage of property value) is applied once to the price of new property only, and the dollar amount of benefits is spread over the analysis horizon, subject to time discounting.

To standardize the disparate results from the various studies, transit premium rates found in the literature for geographically relevant and similar systems are weighted by each corresponding system’s ridership and service area population (which can be obtained from National Transit Database). Inherently the approach proposed here assumes that ridership and population are the two most important driving factors of livability benefits. Further analysis, such as a meta-analysis of premiums conducted by Debrezion (25), should be employed to validate the assumption.

For each year of the defined analysis horizon, prices of new properties are multiplied by the weighted transit premium rates to compute livability benefit of the system, which will be discounted and aggregated as the lifetime amount of value appreciation due to the proposed project. As introduced earlier, benefits are not realized instantaneously. Rather, it is assumed to take 30 years for all premiums to be realized for any given property (an assumption based on average mortgage term for residential homes), and this duration is independent of this BCA’s...
horizon. Instead of assuming a constant rate of realization of annual benefits, a ramp-up is used. The assumed ramp-up process is illustrated in Figure 1.

![Figure 1](image)

**FIGURE 1 Reconfiguration of total benefits to reflect ramp-up of realization.**

The rate at which the premium amount is realized over time is computed as presented in Table 3. The calculations involve redistribution of benefits that are not immediately realized. The first ten years of transit service is assumed to be a ramp-up period and the ramp-up parameter, $a$, is chosen at 30 percent. This means that only thirty percent of the average annual benefit will be realized at first. As illustrated in the figure above, the formulation mimics a log or utility function with diminish marginal return and is developed to reflect a graduate realization of premiums. The resulting general form yields an initial period (ten years) of increasing return in benefits, followed by one of steady state. Given that benefits in later years of the analysis horizon are discounted heavier, the ramp-up factor of 30 percent and ramp-up period of ten years are considered conservative.

**TABLE 3 Estimation of Livability Benefits**

<table>
<thead>
<tr>
<th>Time Horizon</th>
<th>Formulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Ten Years</td>
<td>$a \times \text{Property Price} \times \text{Transit Premium Rate} / b + (1-a) \times \text{Property Price} \times \text{Transit Premium Rate} / b \times (\text{Years of Service}+1) / (\text{Years of Gradual Realization}+1)$</td>
</tr>
<tr>
<td>Rest of Realization Years (=20)</td>
<td>Property Price $\times$ Transit Premium Rate / b</td>
</tr>
</tbody>
</table>

Ramp-Up Parameters: $a=30\%$ ramp-up factors, $b=[30 \text{ years of realization}-0.5\times10 \text{ years of ramp-up}(1-30\%)]=26.5$

The process of estimating livability benefits can be summarized by the following six steps:

1. Review public records documenting existing property values, historical rates of change in values, and historical rates of growth in the number of taxable lots in each evaluation area;
2. Identify proposed alignments and potential station areas and collect data, by property type, on those properties close enough to be impacted for each identified station area;
3. Estimate the average property value growth rate (in the “No-Build” scenario) based on historical transaction prices;
4. Estimate the number of additional properties based on historical land use;
5. Identify appropriate value premiums based on multiple criteria: ridership level, underlying demand, income group of forecast residents, income group of forecast riders, similarity to benchmark systems, development trends and urban development planning;

6. Quantify the incremental livability benefit of station area proximity, discounting capitalized benefits accounted for elsewhere, as follows:
   a. Based on a literature review, select the most comparable transit systems in terms of system characteristics and area servicing;
   b. Compute average transit premiums ranges by property type based on selected systems (property types include general residential (single-family homes, multifamily homes, apartments and condominiums) and commercial);
   c. Compute the scaling factor by property type for average transit premiums using the ratio of associated system ridership and city population to those of the cities in the selected studies;

   Apply the modified scaling factor estimated above by property type to average transit premiums; this yields the expected premiums in the “Build” scenario by property type. FIGURE 2 illustrates the methodology used to estimate livability benefits. Since there are a number of assumptions involved in the estimation, further steps are needed to be taken to minimize the uncertainties of the results. First, area experts should be consulted during the analysis to validate the assumptions used and provide unbiased opinions of the approach employed. The validated inputs, if quantified, should then be subject to a risk analysis to produced risk-adjusted BCA outcomes. By incorporating risk, the analysis avoids the lack of perspective by attaching ranges (probability distributions) to the benefit transfer factors. The risk-based approach allows all inputs to be varied simultaneously within assumed probability distributions to reflect uncertainties in their values, thus mitigating some of the unknown issues inherent in conventional analysis. The approach also recognizes interdependencies between variables and their associated probability distributions.
FIGURE 2 Structure and logic diagram for estimating livability benefits.
CONCLUDING REMARKS AND NEXT STEPS

Funding for transportation projects is scarce and the USDOT is constantly looking for innovative, effective, and efficient ways to allocate its resources and assessment efforts. Even so, the analytical rigor in methods used to justify the economic feasibility of projects should not be compromised. This paper has outlined a benefit transfer approach to applying transit premiums to BCA and provided some of the underlying theoretical framework to support such an approach. The approach provided here is by no means complete and applicable to transit projects of all sizes and scopes. It is intended to introduce a systematic approach for estimating livability benefits in a BCA that can be refined and reproduced.

Several issues will need to be investigated further to improve upon the robustness of the approach. First, the matter of regional transfer should be addressed. Many argue that as development accelerates around transit stations, other areas outside the impact area may suffer economically. However, there may be evidence that the development market is competitive enough that other non-transit-oriented developers can take advantage of the opportunities which may not become available if not for transit. Second, the issue of double counting in BCA is largely unresolved. In particular, opponents of including secondary impacts in BCA, such as livability benefits, argue that the estimates double count other primary impact already assessed, such as travel time savings (35). If indeed this is the case then the results of the BCA can be inflated or deflated. Lewis-Workman and Brod (36) has provided evidence that travel time savings derived from one Bay Area Rapid Transit (BART) station only accounts for 50 percent of the estimated livability benefits. This implies that half of the livability benefits represent a net gain in welfare. A drawback of this paper is not formally attacking this issue of double-counting. Since there is no other empirical evidence on how much is being double-counted, the 50 percent rule is to be applied to discount travel time savings. Similar studies to that of Lewis-Workman and Broad (36) should be conducted to update the comparison between travel time savings and livability benefits so that the results can be generalized and used in future BCA.

REFERENCES

1. U.S. Federal Register, Federal Register / Vol. 77, No. 20 / Tuesday, January 31, 2012 / Notices, Notice of Funding Availability for the Department of Transportation’s National Infrastructure Investments under the Full-Year Continuing Appropriations, 2012; and Request for Comments.


