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The Study of The Economic Impact of Urban Expressways Upon Adjacent Areas

A paper delivered by Frank J. McGilly

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SYNOPSIS: This paper attempts to describe the theory and the technique of a particular type of study of the economic impact of an expressway — the study of the effect an expressway has on the value of property in its vicinity, directed towards the formation of a policy for compensation for expropriation, partial taking, and damages.

Theoretically, the approach is a comparison of property value changes in the area affected by the expressway with value changes in a similar area not so affected. The major theoretical problems are defining the concept of value and delimiting the area of expressway effect.

The technique comprises a number of steps:

- Definition of the affected area, a problem which has inspired some very complicated attempts at solution, one of which (travel-time and usage ratio) is discussed at length but provisionally rejected in favor of the simpler expressway distance factor;
- Selection of a sample area from within the affected area;
- Selection of a "control area" similar to the sample area but not specially affected by the expressway;
- Collection from various sources of a large quantity of data concerning land sales and rentals supported by secondary objective and subjective material;
- Analysis of the data with a view to determining the movement of market values, a procedure which involves the ruling out of uneconomic transactions;
- The recording, through an extended period of time (beginning at a moment when the expressway had not exerted even an anticipatory effect) of changes in property value related to some such variable as distance from the expressway (our present preference), travel time or expressway usage.

It is emphasized that the technique is designed to achieve a strictly limited objective — guidance in compensation — although other uses and benefits will ensue.

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The imperative demand for facilities for rapid motor transportation has forced municipalities in metropolitan areas into the construction of many-laned, limited - access expressways.

Sections of these expressways must run through areas that are relatively well developed, with the consequence that many expensive pieces of property must be expropriated in whole or in part and damages must be inflicted upon the owners of some properties by deprivation of access, separation or isolation of their properties, and so on.

Compensation for expropriations, partial takings and damages represents a large proportion of the total cost of expressways.

Unfortunately, not enough is known about the quantitative effects of expressway development upon the surrounding areas.

Such knowledge is needed to develop policies of expropriation and land acquisition that will be economical for the taxpayer, efficient for the road authority, and fair to the owner of the land to be expropriated.

This paper has grown out of the first steps of a study of **economic impact of expressways in the Toronto metropolitan area**, aimed at the clarification of the problems of compensation for expropriation, partial taking and damages required by expressway construction.

The term economic impact is therefore to be understood throughout in the narrow sense of effects immediately applicable to the determination of compensation.

For the present, economic impact does not mean the effects of the expressway upon the composition and concentration of business in the metropolitan area, nor the benefits conferred or handicaps imposed upon production and distribution of goods, nor any such broad connotations.

Economic impact is to be interpreted as meaning the effect of the expressway upon its neighborhood as it will be relevant to land acquisition.

An Index of Economic Impact

The economic impact of the construction of a metropolitan expressway upon the surrounding area is certain to be diversified. The location of industry will be influenced;

the population distribution of the area will change; the sheer cost of the road will affect the public finance of the governments concerned, and the development it stimulates will alter the tax structure of the community.

In short, transportation is so basic a factor in the economic life of a community, large or small, that the impact of a major mutation in the transportation system is bound to have consequences both widespread and far-reaching.

Characteristics of a Single Index

—Expressway impact, therefore, is easy to see in a vague, general way; but can it be observed in a precise, critical way? Can the observer choose a point of focus such that the diffracted influences of the expressway can be seen to converge upon it as a single phenomenon, a single impact that sums up all the others? If so, then it may be a manageable task to measure the economic impact of the expressway upon the surrounding area; if not, then obviously one must study separately the impacts upon manufacturing, upon population, upon service industries, et cetera. In the latter event, the knowledge acquired will of course be valuable; in fact, whether or not a single index of impact can be found, the partial impacts will continue to be studied in the interests of the parties specially concerned. A single index, however, would have the same value for the roads authority that the Gross National Product has for the economist, the Dow-Jones Industrial Average for the investor, or the batting average for the baseball fan.

The characteristics to be looked for in a single index are these:

- It must be easy to observe — both as to its position at a given moment, and as to its motion over a given period.
- It must be relatively narrow in its definition and simple to express, however complex to determine.
- It must reflect relatively faithfully all the influences bearing upon the object of study.

Depending upon the point of view, economic impact can be registered in various ways. It might be suggested that the extent to which people settle in the vicinity of the expressway (or move away from it) is an indication of the extent to which the expressway helps satisfy human wants. It might be suggested that some measure of business activity — investment,

let us say, or trading volume — would adequately inform us of the expressway's influence in the basic economic processes of production and distribution. It might be suggested that the economic impact of a new road upon its neighborhood is best reflected in the relations of supply and demand in the market for land in that neighborhood — that is to say, in the effect of the expressway upon the price of the real estate in its vicinity.

It may well be that no single index can be regarded as meaningfully representing the net impact of any new element introduced into any economic situation. But, for our present purposes, it is generally and I think reasonably accepted that the play of forces in the real estate market does in fact take almost all the relevant factors into account and does in fact give us a reliable indication of how an expressway has affected its surrounding area with respect to the satisfaction of material human wants. Studies of expressway influence in urban regions, therefore, have tended to focus on real estate values in the areas affected by the expressway. Volume - of - business surveys seem to be regarded as secondary or as special rather than general studies.

Why Study Property Values? —

The pre-eminence of property value change as the measure of economic impact is not so obvious that the pros and cons can be ignored. Why study property values?

First, the change in the prevailing price of real estate in an expressway's zone of influence tells us most of what we can know about the net economic effect of the expressway in that zone.

Second, the behavior of the real estate market in a particular area can be observed and recorded in more or less objective terms — in an increase or decrease of dollars per lot, or per acre, or what have you.

Third, the direction and rate of change can be expressed in terms that are meaningful, even to the non-specialist.

All the other possible indicators that come to mind — those reflecting the movements of people's places of residence and the location and volume of investment or trade — can readily be seen to be included among the forces that ultimately produce the market price of real estate. If people

are attracted to live in the expressway area, property prices will rise—if the expressway repels people, prices will go down. The same reasoning applies to business.

A few reservations, both theoretical and practical, must be mentioned.

The first reservation is the very common one that economic studies cannot be conducted like experiments in physics.

In studying expressway impact, for instance, we cannot isolate the affected area from the other economic influences prevailing at the time—we can only try to devise some way of comparing what happens when an expressway is built with what would have happened had the expressway not been built.

In our economic study of expressway effects we are hard put to distinguish effects caused by the expressway from simultaneous effects not caused by the expressway.

A second reservation about dependence upon real estate values as the index of expressway effects is related to the very fact that the market value is a net resultant of, perhaps, many impacts. It is quite true that this, looked at in one way, is one great advantage of market value as an indication of economic effect: if a simple index is desired, this is the best available one. But a certain price must be paid for the enjoyment of this advantage. The market price by itself does not tell us what the various expressway influences are, it does not tell us which influences tended to raise and which to lower the price, it does not tell us the relative weights of the various influences. Such things have to be investigated independently if they are to be determined.

In the same way, the market process, over a period of time, will take into account factors which are purely secondary effects of the expressway. For example, a certain type of industrial plant, consciously located to take advantage of the expressway, might create a certain atmosphere in its neighborhood. The effect on nearby residential properties, whether good or bad, will inevitably be reflected in an impact study based on property values, whereas it really has nothing to do with the economic impact of the expressway. Again, special analysis is necessary.

What do We Mean by 'Value'?

It is not sufficient to say simply that a particular study is going to

focus on real estate values. The concept of "value" is a many-faced one. In the literature of real estate appraisal and of land economics, the meaning of "value" is the subject of many lengthy discussions. One standard American legal text book on property valuation listed five concepts of market value, each a shade different from the others, which have been recognized by courts in the United States of America.

Sales Prices and Market Value—When a piece of real estate has recently been sold, we have on hand the best possible evidence of its value, namely, the price. Where no sale has taken place, one can try to make use of appraisals, assessments, or in some cases rentals to determine what the market value of a particular property is.

Even in cases where a recent sale has actually been transacted, students of land economics are not satisfied that the agreed-upon price tells us the true value of the property. One of the parties to the deal may have been forced to buy or sell, or may have been ill-informed. Then too, the terms of sale will influence the price. The price in a quick cash sale may be less than the price of the same piece of real estate bought through a mortgage.

It is considered necessary for a study of market behaviour, therefore, to amend the prices in actual sales and to imagine the prices in non-existent sales, and to arrive at a measure of value that is variously known as "real" market value, "justified" selling price, "warranted" market value, and other similar terms.

Rentals and Market Value—Among properties that are customarily rented, like offices and apartments, it is probable that rental transactions are carried out much more frequently than are sales among properties customarily occupied by the owner. Trends in the level of rents in an area ought therefore to make themselves felt more quickly, if anything, than changes in the level of prices.

To fit rented properties into a study based on property values, rental incomes must be translated into property values. The price of a rented property is based upon anticipated profits; the procedure, simplified, is to capitalize the rental profits at a rate accepted as expressing the current return on investment. The capitalization factor can only be an

approximation, subject to many questions, but it serves its purpose.

Certain interesting speculations come to mind regarding rented properties. Once an expressway is definitely projected and its route made known, owners of apartments in the expressway vicinity may anticipate increased demand and consequently higher rents for their apartments. This anticipation will immediately elevate the market price of apartments. But the rents themselves cannot actually be elevated until the expressway is functioning, or is just about to function. So there might be a period when the market price is out of proportion with rental income.

Abnormal Sales and Rentals—With both rental and sales data, there exists a problem of interpretation caused by the occurrence of anomalous transactions. If a buyer or seller of property is acting not willingly but under some form of compulsion, or if the buyer and seller have some family or social relationship with each other which colours their commercial relationship, then their sale price will be out of line, and will only misguide the student of economic impact. The same applies to rentals.

The only solution to the problem of uncharacteristic transactions is the collection of a large body of data. Given the details of a sufficient number of sales, the investigator can discern the general trend of value levels, and can distinguish the sales which are abnormal.

The study will require exhaustive and continuous recording of the movements of value levels. Sales cannot be relied on to be either exhaustive or continuous: not all the properties under observation will be sold, and sales of similar units will not take place at brief, regular intervals. Sales data will have to be supplemented.

The period under study is a period of extraordinary change, more rapid than at normal times. The intervals at which value levels are to be recorded must not be too great, or all precision in estimating rates of change will be lost. Intervals of one year are about the maximum feasible in a study that is likely to last ten years or less.

Appraisals at regular intervals would fill in the gaps in sales, but are likely to be quite expensive. For this reason, it may be more prac-

ticable to borrow the services of municipal assessment departments. Assessors are dealing with real estate values all the time; and even if their assessments for taxation purposes tend to be a good deal lower than prevailing market values, they have at their command, more than any other single agency, the relevant facts and the apparatus for collection and compilation of data. The assessor's information can be applied in terms of market value quite as readily as in terms of assessed value.

Value of Land and Improvements—A last theoretical complication in the interpretation of the concept of "value" is the fact that the value of a piece of real estate is made up of two components — land and improvements. Land acquires its value from the conceivable uses to which it may be put, and the primary determinant is location. The possibilities opened up by the expressway for profitable exploitation of land determine the change that will take place in land value.

In estimating the value of improvements — that is, buildings and services — some basic factors are hardly affected by proximity to an expressway; replacement costs is an example.

The effect of an expressway on the value of a building is in proportion to the effect upon the uses for which the building was designed or to which it can be adapted.

The expressway may affect the uses of a building quite independently of its influence on the value of the land the building stands on. To state the extreme case — extreme but easily conceivable — a building suitable for one particular use may occupy a piece of land that has become capable of much more profitable exploitation through another use. The probable outcome would be the destruction of the building. In such a case, the value of the land would increase greatly, the value of the building would disappear.

Technique

The techniques to be followed in conducting an expressway impact study flow naturally from the foregoing theoretical considerations.

Since the object of the study is to derive principles which can be applied with some confidence to all expressways, there would be some purpose, academically speaking, in deliberating carefully over the choice of an expressway to study.

Regrettably, public authorities cannot be expected to consider suitability for economic study as an important criterion in laying out road building programs; nor, since construction of a major expressway is an undertaking of some years, can the student wait for the ideal economic-impact expressway to be built. One must cut the coat to fit the cloth.

To be ideal for study purposes, an expressway ought to pass through a widely varied territory, allowing observations of its effect on existing industrial, business and residential property, and also allowing observation of new development.

In order to achieve this desirable variety, it may be necessary to choose for study sections from two or more expressway routes. If this is done, sections must be chosen that will be built within a reasonably short time of each other.

Area Affected by the Expressway

—The object of the type of study to which this paper is directed is the impact of the expressway within the area immediately affected by it. This involves a new problem of definition: the definition of the area affected by the expressway.

The most obvious factor in delineating the affected area is distance from the expressway. It is to be expected that land a mile from the expressway will be less seriously affected by it than land a block from it. One cannot be quite so certain that land five hundred yards away is less seriously affected than land three hundred yards away.

Presumably the principal reason why distance from the expressway impresses itself upon us as the chief determinant of the limits of the affected area is the likelihood that those closest to the road can most easily use it. As it happens, this is not necessarily so. With limited access to the expressway, and with the winding roads characteristic of the modern residential subdivision, those living nearest the expressway are not necessarily able to enter it in the shortest time.

One device developed by American traffic students as a means of grading areas adjacent to the expressway according to the extent to which they are affected by the expressway is the travel-time and road usage ratio.

It is presumed in this approach that the primary service provided by an urban expressway to the people who

live near it is relatively rapid access to the other districts of the urban area, principally the downtown district of the central city. Driving times are recorded from various points near the expressway to a point downtown for two routes in each case: the expressway and the best alternative route. From some points, the time saved by using the expressway is considerable, for others less, and of course the stage is reached at which the expressway route saves no time at all. (Oddly enough, it appears necessary to carry the study into areas where the expressway route actually takes longer than the best alternative.) With this information, the area studied could be divided into bands of land defined according to the time saved by using the expressway. Or the bands of land could be grouped according to the ratio of time via expressway to time via alternate route.

Recognizing, however, that travel time is not the sole consideration of drivers, traffic students go a step further. Within each time differential (or time ratio) zone, they carry out traffic counts to determine what proportion of drivers actually choose the expressway. In Arlington, Virginia, for instance, among drivers who could save six minutes by using the Shirley Highway, about ninety-seven per cent chose to do so; of those who could save one minute, about sixty-two per cent chose to do so. Thus the travel-time data are converted into usage data, and points of land in the expressway vicinity can be grouped according to expressway usage. Points beyond which less than fifty per cent of drivers choose to use the expressway may be considered to be outside the area specially affected.

One last word about the use of this technique: By relating on a graph the percentages of drivers using the expressway with the minutes of time they save, a curve can be obtained. In some quarters, it is assumed that the curve derived from the experience of one expressway can be applied directly to others. Thus in a study carried out in Dallas, Texas, the curve resulting from observations of the Shirley Highway in Arlington was applied to the time differentials ascertained in Dallas, in order to convert the Dallas time differentials into usage figures. That is, in Arlington, ninety-seven per cent of the people who could save six minutes by doing so used the Shirley Highway; it was presumed that in Dallas, of the people who could save six minutes by using the Central Expressway, ninety-

seven per cent would do so.

The land in the expressway area is then divided into zones within which similar expressway usage preferences will prevail. The result of such analysis will be a series of bands of land fanning outwards from the roadway. And instead of beginning an impact study with a purely arbitrary concept of degree of impact graded down arithmetically according to linear distance from the expressway, these investigators begin with the much more sophisticated concept of expressway usage.

I have devoted much length to the travel-time differential and its ramifications in order to show the ingenuity being lavished upon this field of study. Admittedly, this ingenuity will not impress the suburbanite who takes pride in the fact that he never goes downtown. As to using the travel-time differential in finding the limits of the affected area, however, a number of questions come to mind. Is travel-time difference as all-important as this technique implies? Is even expressway usage by local residents so over-riding a factor as is assumed? For it is clear that the expressway can benefit people who never use it. Is it not arbitrary to choose one point, whether downtown or elsewhere, upon which to base the travel-time data? (It is logically impossible to use more than one point.) Would the boundaries of the travel-time differential zones be the same under traffic conditions prevailing at different times of day? Lastly, can the relation between usage and travel-time on one expressway reasonably be applied to another expressway?

To me at least, these questions suggest that the travel-time differential is just as arbitrary a method of determining the limits of the affected area as the vastly simpler method of choosing a maximum distance from the roadway that appears to allow plenty of margin, and then observing developments to see whether the impact is in fact felt as far away as one had expected, hoped, or feared.

Whether the method used is simple or elaborate, once some boundary has been ascribed to the affected area, it will probably be necessary to select from it a sample zone or zones to be studied — unless a vast staff is available for the work of studying the whole area. What is sought is a sample that includes a representative range of residential, industrial and commercial properties and, if possible, has raw

land zoned for such uses. It would seem advisable to devote particular attention to special cases such as automobile service stations and restaurants, which can be affected very favourably or very adversely depending upon circumstances.

Control Area, Unaffected by Expressway — Not all the changes experienced in the sample area during the period of study can be credited to or blamed upon the expressway. Some technique must be used to distinguish the expressway effects from economic changes that are not effects of the expressway. It is difficult to see how these non-expressway effects can be quantitatively separated out one by one—the effect of the general economic climate, for instance.

What can be done is to select a control area remote from the expressway that is similar in character to the sample zone, and to observe the behaviour of property values there.

The control area should resemble the sample zone in as many respects as possible — size, level of values, property composition; it is suggested that the sample and control areas ought also to have had similar histories in the real estate market, the same ups and downs in price levels.

To the extent that price changes during the study period in the sample zone are the same as those in the control area, the expressway is considered not responsible for the changes; to the extent that price changes in the sample zone differ from those in the control area, the expressway is considered responsible.

Data Required and Sources — It is easy to see what the principal data required will be:

- All possible material data relating to property sales (under the Ontario Land Titles Act and the Registry Act, land purchases must be reported to public authority).
- Assessments for purposes of local taxation, adjusted as closely as possible to current market values.
- Information on rental incomes.

The following types of information are secondary, but are most useful:

- Zoning bylaws governing land use in the sample area and the control area.
- Traffic data (travel times, usage of collector and service roads, accidents).
- Data relating to retail sales.

- Opinion interviews with people who live and work near the expressway.
- Scientific measurements of noise, vibration, and atmospheric pollution through gasoline combustion.

Opinion interviews are the only means of learning the subjective reactions of people, but they are unreliable. Persons being interviewed appear to express their prejudices and their aspirations as often as they do their real opinions; frequently the opinions expressed by people are contradicted by their own behavior, let alone by objective fact. Hence the necessity to measure the nuisance factors created by the expressway, as well as to inquire about them in interviews.

Time

The conclusions reached in an impact study will be impaired unless the starting point is a moment of time at which the expressway has not exerted any effect upon the values of properties.

The anticipation that an expressway will be built in a certain district naturally causes a speculative stir in the market for properties there; so research into property values should be partly historical — it should look back to a time at which the levels of values in the sample zone and the control zone were generally equal.

The study should then continue to record changes in the level of values at least until the expressway has been completed and has made its initial impact. It would be better to continue the study somewhat longer — until home owners and businessmen have had time to stabilize their feelings and thoughts about the benefits of dwelling and working near an expressway. This may be a matter of two or three years.

Uses and Benefits

The central objective of the study projected by the Citizens Research Institute, on which the foregoing has been based, is the formulation of principles to guide a road authority in its expropriation policies.

Land acquisition practices based on solid information and reasoning would improve the attitude towards expropriation on the part of both the public agency and, one hopes, the private owner. Until the returns are in, I should guard against any suggestion that compensation would be more or less generous as a result of impact studies; what is looked for is a great saving in time and trouble

wasted in negotiation and litigation.

If impact studies are eventually successful in producing formulae for prediction of property value changes resulting from expressway construction, roads authorities will be able to take expropriation costs into account in choosing expressway routes with somewhat more certitude than they do now.

Urban land costs soar to such dizzying heights as \$350,000 an acre; an average mile of urban expressway swallows up about 25 acres. A formula that helped save even five per cent or ten per cent in expropriation charges on only the most expensive segments of urban expressways would be a valuable tool.

An inevitable by-product of an impact study will be a store of information concerning land use, advantageous and otherwise, which will be of value to planning authorities.

Among the advantages of expressways listed by their exponents is the increase in local government revenues ensuing from increased assessments of properties. There is something in this, of course, but the benefits should be weighed against those that would result from spending in other ways the vast sums of money

involved in expressway construction. Local governments will, however, certainly gain something in property taxes from properties in expressway areas. Advance knowledge about the probable nature and extent of the changes in assessment will assist local government authorities in their budgeting and in the financial aspects of planning.

So far, all the uses of impact studies listed have been related to the requirements of governments. Their potential usefulness to private interests should not be overlooked.

Finally, there is a residual category of uses of impact studies which might be labelled "The Unforeseen."

One example will show what I mean. In California a few years ago, there arose a suspicion that the residential properties immediately adjacent to expressways were worth less on the market than those a block or so away. Several lending institutions consequently adopted policies limiting individual loans on homes alongside a freeway. The California Division of Highways made a special study of price trends among homes adjoining freeways compared with homes a little further away. The result showed that prices of freeway-adjointing homes tended to

be very slightly lower, over-all, than homes further from the roadside. The slight difference was mostly due to homes with very shallow yard areas between the house and the freeway fence. On the whole, adjoining properties were found to have maintained their values as well as slightly more distant ones. The inference for the real estate market is clear enough.

I for one would not have foreseen that a study of this specific point would ever be called for, and I am sure that other applications of impact study data and techniques will arise.

Conclusion

In Canada, there has been little if any work done of the nature described in this paper. If there had been, perhaps some of the complications and questions in the technique of economic impact study might have been removed.

It is a sobering thought that a study like this, complex and difficult as it seems to be, is concerned with only one aspect of expressway construction, although granted an important aspect: land acquisition.

This type of study leaves aside the questions of who ought to pay for the expressway and how; where the expressway ought to go; and, for that matter, whether the expressway ought to be built in the first place.

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