Region consequences of the transport impacts quantification[1]

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1. Introduction

The region as a system of many various subsystems is influenced by geographical location, demographic structure and obviously by transport system. The quality of transport has many positive and at the same time negative impacts. One of many impacts of transport is time delay during traveling, commuting and other kinds of travelling. Practically it as possible to talk about negative externalities namely then traffic congestions. The main cause of road traffic congestion is that the volume of traffic is close to the maximum capacity of a road network. Congestion is slowly becoming as a leading and is sometimes being considered as the worst impact from transport. More important, it is getting worse, year by year. This is because road traffic is growing faster than road capacity. It is basically not a temporary problem: it will continue to be the main case, because one of reasons is fact, that it is very difficult to match traffic reduction programs together with trends in traffic growth.

Trends of traffic growths are unlimited and it's required to come up with adequate traffic and transport programs made by government and regional institutions. Under current social and economic frameworks, there are no feasible policies that could reduce congestion to zero. The 'cost of congestion', as used for calculations and value models, is based on relationships which in reality are not exact, stable or even meaningful. Models of value quantification from transport impacts are extremely complicated basically due to instability of traffic situations.

On the part of the value of cost connected with congestions there have been several models for their quantification. The quantification of cost from traffic impacts would be the first steps toward economies from traffic congestion because so far no subjects take to the its

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cost or earning. The total cost of congestion is a large number, but it is practically quite low as compared to for example cost of traffic accidents. Nevertheless it should not be used as a target for policy and policy makers but as a kind of background for other policy targets in region development and growth programs.

Prime presumption for traffic infrastructure improvement, or better say, the situation and reliability, is to quantify explicit and implicit costs involved in transport. Resulting values might be applied in analysis and studies about regional growth and development. The consequence of externalities in connection with transport in global world in the context of comparative advantages takes on importance above all with growing number of vehicles. This growth tendency is happening in the whole world regardless of economies level, culture or any other aspects. The region consequences of the transport impacts quantification is the main target of the paper.

2. The value of travel time

The usual steps which are made when there is a need to quantify and measure transport impact on region used in most of studies are to explore the value of travel time. Methods used in valuating travel time can be divided into two basic approaches:

- The marginal productivity of working time
- Consumer behaviour.

The first of these is most commonly used in valuing travel time savings during working hours. It relies on the thesis that such time savings can be diverted to marginal production, with due allowance for any production during actual travel time.

The second approach has two aspects to it:

- travel preference, in which a choice is exercised between slower, cheaper and faster, more expensive travel options
- time allocation among activities. E.g. the work/leisure trade-off.

In general, analyses of time values relying on the marginal productivity approach have been theoretical. Those relying on preferences in consumer behaviour have been empirical, and those on time allocation have been a mixture of empirical and theoretical.

2.1. Marginal productivity of working time

For valuing working travel time savings, a common practice is to establish a value on the basis of the information obtained from the market mechanism. Because there is a market for labour, values of travel time savings during working hours can be related to wages, or earning power. The most of studies are based on the economic rules that people will work and employers will hire labor as long as its value to them is greater than its cost. So the average wage rate is useful to measure the value of production lost or gained by changes in the workforce. But imperfections in the economy cause inaccuracy of the wage rate as a base measure. For example minimum-wage and maximum-hours legislation.

Travel time saved by employees in the course of their work can be regarded as a change in productive time, and that is why if production remains constant, there will be savings in direct or indirect labor costs. The main problem of this approach is the finding out the direct impact of road system on productive time.

2.2. Consumer behaviour approach

The consumer behaviour approach is focused basically on non-working time savings. This refers to time outside of working hours and includes all journeys for which no payment is received from an employer. Investigation of these values attempt to infer a value of time by examining the trip makers' behaviour in situations where there is a choice between money and time. Given the fact that the value of travel time savings partly arises out of the disutility generally attached to traveling, it means that travel time cannot be viewed independently of other trip attributes, particularly those relating to comfort standards. The disutility of trip making is presumably related to the physical and mental effort expended in performing the activity of traveling. It is difficult to separate time spent in traveling from the comfort experienced in traveling as they are by nature joint attributes. The earliest efforts in evaluating travel time savings during non-working hours have sought answers in consumer-choice theory. This theory was basically designed to explain an individual's preferences among 'alternative baskets of goods'.

2.3. Behaviour approach

Most investigations of the value of travel time savings have been based on the behaviour of trip makers when faced with alternative situations. Such investigations usually

comprise estimation of the trade-off between the time and money cost dimensions of travel 'packages'. A travel package is defined by such dimensions as total travel time, in-vehicle time, walking and waiting required, and the cost of travel. Alternative routes or alternative modes to a given destination represent different travel packages involving different combinations of trip attributes.

3. Real time traveling cost

Theoretical methods for determination the value of travel time are mostly used in studies related with regional decision making, projects etc.

Time spent on the way, or also sometimes called like travelling expenses, is invoiced mostly by firms or companies, which provide to consumers certain servicing, service. At those activities there are secondary cost which are costs on transport and time spent on the way. Item transport is mostly charged as beaten kilometers, or can be also given lump sum on certain distance. Further it is also important and from that is set rate per kilometer, which vehicle is used and it tons capacity. General prices rates for 1 km are e.g. at personal car ca. 8,- Kc/km, at vans up to 3,5 tons load ca. 12,- Kc/km and at big truck above 12 tons load price is about 40,- Kc/km. Rates for km include costs on amortization of vehicle, consumption fuelling, toll, road-traffic tax and of course profit. Toll is always charged separately.

Amount time spent on the way (travelling expenses) is mostly charged in hour rate, which refers to time which employee or staff spent on the way namely from place of departure to place of destination and back. Rate per 1 hour spent on the way is between 100 – 120 Kc. Such cost is charged separately on invoice only in cases, when range of order was non - profit - making, which means that costs on transport and travelling expenses were higher than gain from order.

4. Evaluation method

Most methods used for time valuation have been made by preferences, where an implied value of time was a by-product of some descriptive or explanatory mathematical model of travel choice. These values were frequently implied by the ratio of estimated coefficients in a linear function. Typically these coefficients were estimated with quite large standard errors (albeit that the coefficients were generally significantly different from zero). The standard errors of the ratio of such coefficients only rarely presented in such work, and is typically were large indeed. The types of models developed for these techniques are stochastic

and disaggregate. They are stochastic in that the predictions obtained from them are probabilities that individuals will make a specific travel choice. The probabilities are assigned on the basis of the characteristics of the choice environment as perceived and evaluated by the individuals. They are disaggregate in that the bases of the models is the individual trip maker rather than zonal aggregates The basic hypothesis underlying these models is that decisions are based on the relevant attributes of the available alternatives, evaluated in terms of the trip maker's preference functions. These decisions enable an estimation of the rate of trade-off among various transportation system attributes. More specifically, if measures of both time and cost of alternative transport decisions are included in the model, the rate of substitution of money for travel time can, at least in principle, be determined and interpreted as a value of time.

4.1. Discriminant analysis

Discriminant analysis was among the earliest techniques used in developing a behavioural model in this context. It was used to determine a function of user and transport characteristics that best discriminated between populations groups of trip makers on the basis of the transport 'package' they used. The choices analyzed were binary choices that are the choice involved only two alternative packages. Thus the problem was that of determining a set of discriminant functions Dij (where Dij is the discriminate function between travel package i and j) that minimized misclassification by the model, in terms of choice of transport package. The discriminant function in general terms can be expressed as:

$$Z_{ij} = \sum_{k=1}^{n} \alpha_k (f(X_{ki} X_{kj})) + \sum_{l=1}^{m} \beta_l U_l$$

where Xki, Xkj = the values of the kth attributes of the ith and jth travel packages

U, = user attributes

αk = parameters associated with the alternative systems

βk = parameters associated with user characteristics

f(Xki, Xkj) = is a function that may take either of the following forms:

a) (Xki - Xkj

b) (Xki / Xkj).

The solution to this problem will be approached from two standpoints:

- minimizing misclassification with respect to some predetermined threshold;

- seeking to find conditions in which the separation between the two populations is greatest in relation to the variation within each population. The shown analysis is one of many analyses used for evaluation the travel time. Next research will be concerning other models and analyses.

5. Conclusion

Region consequences of the transport impacts quantification are closely related to regional studies and analyses. Decades ago there was practically no need to finding out value of travel time, cost of congestion. The reason is very simple. Capacity of transport systems were sufficient for the amount of vehicles used in that time. Nowadays the number of vehicles is rapidly growing and capacity of systems has already reached its maximum. It is not problem only for urban areas, but it is becoming problem also for rural parts of region. Time delays due to traffic congestions causes cost for all participants no matter from which part of region they are. Any attempt for improving coming collapsing situation requires quantification of transport impacts. This is basically goal of next research.

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