

AFFECTING FACTORS OF TRANSPORT DEMAND

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Transport demand is described by factors based on interaction of social and economic activities divert in a place.

For understanding factors which influenced demand it is important think about decision making from aspects of users or operators. To see the problem from this perspective isn't easy.

Costumers often make their decision rather on provided service of "door to door" transfer between origin and destination than on average quality of service.

That means that they think about aspects of ride, which are not influenced by function of transport, as:

- safety of walking from origin to station,
- relative attractive of alternative modes,
- time and discomfort set up by travelling, except charges for transfer service.

In national economy view is demand influenced by:

- in cargo by progress in goods market, so it depends on production of goods, increase r decrease of GDP,
- in public passenger transport it is given changes in lifestyle and industrial enterprise restructure,
- these both modes are affected by state and development of infrastructure.

1. Transport models

First models of transport demand were developed by geographers and engineers. They tried in forties of last century to find similar patterns for human behavior, as it was found in real world and which in fact were based on social physics ideas.

This is why we can found critical influence of these models in concept of "gravity model" or in ideas of scarcity and transport costs, which are understood as resistance. These models are aggregate, because they don't try to simulate individual trips. But even then to correspond with behavior in a time, these models must take into account presumption about human behavior. The most common simulating system is know as Four step model. The steps are:

- **Trip generation** - this step determines a number of trips from and to a traffic analysis zone. These frequencies could be found by research or by calculation as function of the social and economic attributes of households.
- **Trip distribution** - the step determines how these trips are divided in different destinations. The result of this step is OD (origin destination table).

Tab. 1 Illustrative trip table

Origin \ Destination	1	2	3	Z
1	T11	T12	T13	T1Z
2	T21			
3	T31			
Z	TZ1			TZZ

Where: T_{ij} = trips from origin i to destination j . Note that the practical value of trips on the diagonal, e.g. from zone 1 to zone 1, is zero since no inter-zonal trip occurs.

Source: http://en.wikipedia.org/wiki/Trip_distribution.

Origin destination table are found again by research or calculation. The gravity model, the Fratar model or non-linear programming can be used for calculation.

- **Mode choice** determines trips division among transportation modes. This step uses theories of choice, especially logit model, which uses probability (p), that a passenger uses a certain transport mode:

$$\text{logit}(p) = \log\left(\frac{p}{1-p}\right) = \log(p) - \log(1-p).$$

- **Trip or route assignment**, which settles specific streams from OD table to transportation network. This trip is mainly used for a road transport. Methods,

which are use for this step, are the shortest journey method or weighting assignin to 2 lines method.

The fifth step is often added. This is based on pressumpiton, that passengers rather changes times of their journey than their line (for example because of congestion).

2. General demand model

General functional model of costumers demand for goods (or service) i is given by

$$Q_i = X_i(P_i, P_j, \dots, P_n, I, \varepsilon) \quad (1)$$

where:

Q_i – demanded quality of the goods (service)

X_i – function of demand for individual consumer depend on demand factors,

P_i – price of goods (service) i

$P_j - P_n$ – prices of other individual goods(services)

I - costumer's income,

ε - residue.

After setting an economic model it cen be specified by mathematical establishment as:

$$y = a + bx_1 + cx_2 + dx_3 + u \quad (2)$$

Parameters (a, b, c a d) could be statistically estimated, for example by method of least squares.

This general model can be also used for transport demand, even if there is little specifics at transport market.

It is important to find answer for question, what the costumer really asks:

- If it is the ride,
- or if it is the ride in transport mode,
- or it could be ride in specific line.

3. Factors, which take effect in transport demand

According to mentioned aspects, appealing factors in transport demand are:

- physical characteristics of transporting things (goods),
- price,

- income level,
- relative price of other transfer services,
- speed of service,
- quality of the service,
- taste or preference to demand the service.

Physical characteristic of transporting things (goods)

These characteristics have effect especially in cargo. It could be:

- small range of goods with high value (for example electronic component for expensive machines, gold, diamonds etc.),
- special fashion clothing goods,
- goods with short storage life,
- goods with acute reserve,
- goods with acute or guaranteed international and national supply,
- bulk goods with low price,
- bulk goods with high price.

Price

Price doesn't cover up only monetary costs for fares or freight, but also other price elements (time costs, waiting, uncertainty) putting together as generalized costing index.

Rate tariff change may influence primary demand in this ways:

- by decrease the market price of the product (service) can decrease too, the market can increase and also the demand,
- by increasing, ceteris paribus, the sale price can increase and then the demand can be reduced (with negative economic result for operator and customer).

Price of transport in demand function can be reflect as total or combine pay for time, strain and monetary costs, which passenger or transporter thing about and which represent user costs.

Income level

With income increasing there is also increase of quantity of traveling (number of trips or travelling kilometers). This is typical not only for business trips but also for leisure trips. There can also be more trips with public city transport.

With increasing income there is more cars possessing by households, and this is why passengers use public transport.

Changes in incomes make different changes for long-term and short-term demand. While increase of income makes rapid decrease of demand level, in long term people adapt their expenses models.

Relative price of other transfer services

Transfer of business between different transport modes and enterprises is affected by:

- relative levels of fares/freights in railways, bus and air transport and perceiving costs of car travelling (this means price of petrol, toll and parking charges),
- different characteristics of transport mode, where each of one is trying gain costumers by supplied service,
- outcome heterogeneity, which reflect acceptation of alternative estimating procedures.

One of the most interesting findings is almost total demand for car using in cities insensitiveness to public city transport fare level.

Better than public city transport fares subsidy and parking restriction, it is more powerful for demand increasing the increasing of parking charges or building new parking places out of the city center.

In cargo analysis of different prices effects is more complicated, because requirements for price and service quality are confidential both for operator and costumer.

Speed of service

Time is an important factor especially in passenger transport, for example businessmen consider the value of the time and they preferred faster transport modes. The success of high-speed trains is given not only by their speed, but also by other factors as safety, comfort and regularity.

In road transport the higher speed reflects on increasing of vehicle productivity and decreasing of costs per ton or kilometer, and so than the tariff for costumers can be decreased too. The lower price support demand increase.

Quality of the service

Because the quality is one of the most important demand factors, it is necessary to include this to demand function as any price factor. Quality could be expressed by these partial factors:

- frequency,
- service level,
- comfort,
- reliability,
- accuracy,
- security.

Transport service quality, defined by these partial factors, will stimulate demand. The quality, which is good and appreciated by customer, reflects on financial value (as price for transport).

Taste or preference to demand the service

In these days there is an increased orientation of society to demand individual passenger road transport.

With life level increasing there is an increase of leisure time and desire to more freedom given by individual motorism. The more people also move from living in city center to outskirts.

In long-run public transport a demand reacts first of all on service quality, especially on any speed decrease or frequency of the service. And so a price doesn't have the most impact in this sector.

Users of local public transport prefer mainly low fares and then reliability, higher frequency of offered connections, covered bus stops etc.

We can see in cargo that the price often isn't the crucial factor for choosing transport mode. Many enterprises still have their own fleet, so they prefer quality of service as reliability, speed and facility rather than price.

4. Demand samples not affected by transport operators

Segments of demand which are not affected by operators are invoked by:

- demand peak,
- changes in social habits and behavior of society,
- changes in services and prices of competition,

- changes in inhabitants' lay-out.

Demand peak

Peak in transport means time, when the demand is the highest. This could affect both operator in cargo and also in passenger transport.

Examples of demand peak origin:

a) daily time - morning and afternoon peak

Problems: requisite of higher transport capacity and number of motor vehicle, so some train set, set of underground trains or buses and trams are used only during peaks.

Acquisition possibilities: disintegrate of the peak by changes in fares and time ticket availability.

b) day in week – summer weekend peaks in leisure time on roads and in public passenger transport, Friday peaks and Sunday returning, higher streams of car on holiday, when the weather is nice.

Problems: requisite of higher transport capacity.

Acquisition possibilities: introduction of „economic tickets“, different relation of fares to disintegrate peaks of Friday's departures and Sunday's arrivals.

c) seasonal peak – concentration of transport during summer and winter holiday, raising goods transport.

Problems: requisite of higher transport capacity in times of winter and summer holiday, temporary lack of transport capacity of trucks.

Acquisition possibilities: off-peak fares and freights discounts, operation leasing use, and use of subleasing during raising goods transport demand.

Changes in social habits and behavior of society

These changes are invoked by raising of peoples leisure time by:

- shortening of workweek,
- unemployment grow,
- possibilities of forward or enforced retirement.

Result: more trips are in leisure time.

Social habits were also changed by car property grow and changes in using and relationship to public transport.

Reasons:

- hypermarkets and sport centers building-up out of city centers, this leads to demand of roads and parking and to public transport demand reduce.
- social visits during weekends and evenings journeys to theatres and cinemas by public transport was reduced, because of using private cars,
- demand for places in cinemas was substituted by televisions and home cinemas, and so the demand for evening public transport was reduced too.

Changes in services and prices of competition

An improvement of alternative transport services (as low-cost cargo airways), achieved mainly by lower prices, leads to changes in demand for transport services in individual operators.

Changes in inhabitants' lay-out

These changes were subject to building-up of suburban town, rising of number of private car owners and needfulness of new housing stocks and substitution of the old one.

For example public bus transport provider has a possibility to ensure transport of new housing estate by two ways:

a) to provide service with loses, which will be operating after building-up just few houses, and hope, that he gains other costumers after the whole housing estate will be finished,

b) to begin provide service after the whole housing estate is finished, but the owners of flats and houses could buy private car, so than the market is lost for the provider.

Changes in inhabitants' lay-out, which also stack up by decrease of demand for transport services, could be given by:

- population decrease,
- population transfer from rural areas to urban areas within regions and whole country,
- population transfer from more behindhand areas to more prosperous ones,
- most recently return of people with higher incomes to living in city centers (because of travel time reduction).

Conclusion

Demand for transport company services originates at dynamic transport market, which is complex and unstable. At the market transfer requirements defined by place and time dimension are applied.

Transport demand is invoked by motivation, which must be searching out of transport sector. The motivation gets out in different times and places. So the operator and managers of transport companies must know primary demand for above-mentioned transport requirements. When they could predict these requirements, then they could easily predict transport demand.

Transport company, which tries to ensure long-term being at transport market, must attend to analysis of factors, which takes effects on its services demand.

To gain information about the demand quantity and factors, which can be affected by its marketing and economic activities at transport market, need to take case of these problems:

- market structure in transport,
- demand characteristics in transport,
- demands not affected by transport operators,
- demand elasticity in transport,
- measure of demand quantity and market research.

Manager of transport company must take into consideration many factors, which take effect on transport demand. Effect of these factors could be simulated by transport demand elasticity.

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Resumé

FAKTORY OVLIVŇUJÍCÍ POPTÁVKU PO DOPRAVĚ

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Manažeři dopravních podniků musí při rozhodování o podnikání v dopravě zvažovat mnoho faktorů působících na velikost poptávky po přepravě dopravního podniku. Za tyto faktory lze považovat opakující se změny fyzikální charakteristiky zboží, ceny přepravní služby, úrovně příjmů zákazníků, relativních cen ostatních přepravních služeb na trhu, rychlosti přepravy, kvality přepravní služby, vkusu, módnosti a zálib poptávat přepravní službu. Vzorky poptávky neovlivnitelné dopravním podnikem vznikají působením problémů špiček v přepravě, změnami v sociálních zvycích a společenském chování zákazníků, změnami v konkurenčních a jejich cenotvorbě a změnami v rozmístění obyvatelstva.

Elasticita přepravní poptávky pak umožňuje modelovat vliv těchto faktorů na velikost poptávky po přepravní službě dopravního podniku.

Summary

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Manager of transport company must take into consideration many factors, which take effect on transport demand. These factors are physical characteristics of transporting things (goods), price, income level, relative price of other transfer services, speed of service, quality of the service, taste or preference to demand the service.

Effect of these factors could be simulated by transport demand elasticity.

Zusammenfassung

FAKTOREN DIE NACHFRAGE NACH VERKEHR BEEINFLUSSEN

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Die Manager in Verkehrsbetrieb müssen bei Entscheidung über Transportgewerbe viele Faktoren effektmachende über die Größe der Anfrage nach Transport des Verkehrs Werkes in Rechnung stellen. Für diese Faktoren kann man einen wiederkehrenden Wechsel physikalischen Kennziffern der Ware halten, des Preises der Frachtleistung, das Niveau des Empfangen Kunden, einen Relativpreis sonstiger Beförderungsdienstleistungen auf dem Markt, Geschwindigkeiten des Versandes, Qualität der Frachtleistung, Geschmack, Mode und Vorliebe all diese Faktoren beeinflussen die Nachfrage nach Frachtleistung. Musterware einer Anfrage, die nicht vor Verkehrswerk beeinflusst sind, entstehen unter der Wirkung von Problemem einer Spitze in Transport, einer Änderung in sozial Gewohnheiten und gesellschaftlichen Kundenverhalten, Änderung in konkurrierende und im Preisbildung und Änderung in Verbeitung der Bevölkerung.