

Providing Transport Services Based on the Gross Cost and Net Cost Contracts

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Abstract The paper deals with an issue of the impact of a contract form choice on providing public transport services and its influence on a scope of transport services. The first part of the paper describes the current situation in selected countries and then various contract forms. It also analyses the existing risks and possibilities for their allocation between the contracting parties in the field of public transport provision. Further part of the paper describes an approach of public service operators to net cost contracts and gross costs contracts.

Keywords contract, transport, service, risk, responsibility

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1. Introduction

Within Member States of the European Union, the majority of public passenger transport services cannot be provided on a commercial basis. Public authorities must ensure providing transport services even in times of low demand, particularly in the evenings and at the weekends. The aim of transport serviceability is to provide inhabitants with the satisfaction of their basic transport needs such as travelling to work, schools or health care facilities. Furthermore, it is necessary to provide public transport services with regard to social and environmental factors and to provide special tariff conditions for particular groups of passengers such as students and pensioners (Regulation (EC) No 1370/2007) who have no other options of transport than public passenger transport.

In 2007, a new Regulation (EC) No. 1370/2007 came into force and it is currently valid throughout the European Union. It regulates the conditions of providing public transport services in EU Member States. According to this regulation, it is possible to ensure providing public transport services through a direct award in rail and road transport only in the case that a public service operator is owned by the public authority, or the subject of contractual relationship between

the operator and authority is providing public transport services with maximum annual performance of 300 000 km or a maximum price of performance is 1 million €/year (van de Velde, 2008). The direct award is also possible for the operator who operates not more than 23 buses with maximum annual performance of 600 000 km and a maximum performance price of 2 million €/year. In all other cases, the public authority is obligated to ensure providing transport services through a competitive tendering.

In Slovak regions and cities up to 2009, any public transport services were ensured without a competitive tendering. Contracts were awarded directly to particular operators. The most common contract form was gross cost contract where a part of cost risks are transferred to a public authority. The form of such contracts is similar to management contracts under which the authority assumes all risks (revenue and cost risks) associated with providing public transport services. According to the existing contracts, the authorities award the exclusive rights to a particular operator and this enables the operator to provide public transport services. Moreover, authorities grant a financial compensation to the operator in the case that fare revenue does not cover the operator's costs. In addition to reimbursement of costs, the operator is entitled to a reasonable profit. A similar system of contracts exists also in other countries of Central Europe (e.g. the Czech Republic, Hungary, and Poland). Under the contracts between

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authorities and operators in mentioned countries, the authorities are obligated to assume all economically justified costs calculated by the operators. However, it is problematic for authorities to control eligibility of individual cost items. Under contractual relationship, the operator is entitled to the reasonable profit in addition to cost recovery. In accordance with applicable legislation regulating contracting for public interest services (Act No. 56/2012 coll.), the reasonable profit in terms of methodology for its determination is a matter of an agreement between contractual parties – the public authority (self-governing region or city) and the operator. In all contracts made in the SR up to 2012, the reasonable profit is determined in the range from 3.5 to 5.0 % of the economically justified costs¹. A similar approach can also be found in some other EU Member States, despite the fact that determination of the reasonable profit as a percentage of the costs is not economically correct procedure (Poliak, 2013). For example in Hungary, the public service contract between the operator and public authority (the city of Budapest) contains provisions under which a level of the reasonable profit is maximum 4 % of economically justified costs². On the other hand in the Czech Republic, a new Decree No 296/2010 was adopted in 2010 and it stipulates a level of the reasonable profit at a maximum level of 7.5 % of operating assets per year. Deficiencies of such determined reasonable profit are discussed in detail by Poliak (2013), Fendeková and Fendek (2010).

The public authorities in the SR have problems with the financial resources to cover the demonstrable loss of operators. Therefore, the mechanisms for reducing financial resources of providing public transport services from the authorities' position without a quality reduction are being sought. Requirements of quality assurance in providing public transport services are elaborated in detail by Konečný (2011). One of the possibilities is to transfer a part of the risks to operators. There is also an option to transfer all risks associated with providing public transport services to operators and enter into the contract under the net costs (net cost contracts). The aim of this paper is to analyse the risks related to providing public transport services and the risks which arise from concluding gross cost contracts and net cost contracts.

2. The Risks and Possibilities of Contracting in Providing Public Passenger Transport Services

Financing public transport services cannot be assessed independently without an analysis of the risk which is borne by an operator in providing public transport services.

¹ e.g. Public service contract for urban bus transport in the city of Bardejov – the reasonable profit is 5 % during the contract period (the contract is valid until 31.12.2018)

² Public service contract in urban transport between BKV operator and city of Budapest; 2008

Existing risks can be categorised into (Valach, 2001), (Fotr, 1992):

- Systematic risks – such risks include political risks (government decisions, changes in government policy, etc.), international risks (changes in foreign exchange rates, etc.), economic risks (price development, population purchasing power, etc.), interest rate changes, the inflation risk, and the risk of unforeseen events.
- Unsystematic risks are the risks associated with the revenue of company and its ability to cover liabilities. These risks may be influenced by an investment project quality, deployment environment, qualified management, etc.

Regarding to providing public transport services, van de Velde (2008) deals with the risk analysis and he divides the risks into:

- Cost risk: the risk related to an incorrectly predicted level of operating costs and the incorrectly determined residual value of investment costs at the end of a contract period.
- Revenue risk: the risk related to a revenue decrease due to the decline in demand for public transport services and the passenger structure changes.

2.1 The Operational Cost Risks

The cost risks are characterised as the risks arising from the difference between the calculated (predicted) costs and the actual costs after the performance realization. In other words, the risk associated with the payment allocation of the difference to the person who bears the risk. If the operating costs are higher/lower than those predicted in the contract, it will be necessary to determine an entity that will be responsible for potential losses.

The cost risks can be further divided:

- External cost risks: the risk that cannot be influenced by operators at all (e.g. cost increasing due to flooding streets in the event of natural disasters). This group can also include the risk which can be influenced by operators indirectly or only in small extent (e.g. changes in energy prices during the contract period, change of employees' costs, etc.)
- Internal cost risks: the risk that can be influenced by operator, e.g. the costs of maintaining of vehicle fleet (the operator can decide on the maintenance process in order to avoid failure of vehicle and higher costs). (Kilianová, 2012).

2.2 Investment Cost Risks

In this case, it is basically determination of the asset residual value at the end of a contract period. In other words, it is the determination of the risk liability associated with the property and asset value (infrastructure, stations, vehicle, etc. in the case of public passenger transport).

2.3 Revenue Risks

The revenue risk is characterised as the risk of a

decrease/increase in expected revenue. This represents determining responsibility in the case that the revenue is lower than that anticipated in the contract. This risk can be borne by public authority as well as operator. The revenue risk can be divided as follows:

- Revenue risk associated with a decrease in demand - it is a risk related to the changes in number of passengers carried when providing public passenger transport. In the case that the authority (self-governing region or city) bears the revenue risk, it is necessary to appropriately involve the operator in compliance with required quality because the amount of the compensation in this case does not depend on the number of passengers carried.

In the SR, this risk is very significant because the demand for public passenger transport expressed in passenger-kilometres (pskm) is decreasing annually in road and railway transport.

While the performance of regular bus transport was at the level of 8.4 billion pskm in 2000; in 2013, it was at the level of only 4.388 billion pskm (Table 1). It represents a performance decrease by about 48 %. A similar development can be also observed in railway transport where the performance was at the level of 2.87 billion pskm in 2000. In 2013, performance of railway transport achieved the value of only 2.485 billion pskm. This represents a performance decrease by about 13.4 % (Table 1). Table 1 shows data from the whole SR, however, the performance decrease is not the same throughout the territory of the SR. Therefore, when it comes to the revenue risk associated with a decrease in demand, it is necessary to distinguish territories in which the transport services are operated.

Table 1. Performance Development (in million pskm)

Kind of Transport	2000	2005	2008	2009	2010	2011	2012	2013
Railway Passenger Transport	2 870	2 182	2 296	2 264	2 309	2 431	2 459	2 485
Regular Bus Service	8 435	7 525	6 446	4 538	4 436	4 611	4 584	4 388
Urban Transport	1 173	1 399	1 370	1 127	1 119	1 172	1 137	1 145

Source: authors based on [8]

The development of number of passengers carried depends to some extent on the interventions of public authorities which can indirectly influence the number of passengers carried through fulfilling their strategic objectives. The strategic objectives of public authorities can be divided into (Stanley and van de Velde, 2008):

- *economic* - maximizing the effectiveness and efficiency of resource use (e.g. limitations of unused connections, fare increase for less used connections, taxation of passenger cars as a source of compensation for losses of public passenger transport, etc.);
- *environmental* - minimizing the impact of transport in

the served area (e.g. limiting access of cars at defined time intervals in the serviced territory);

- *social* - ensuring possibility of mobility for all people, particularly for vulnerable groups of passengers (discounted fares for students, pensioners, etc.);
- *public* - planning transport policy and other policies in a region (e.g. deployment of schools raises a demand for carriage, etc.).
- Revenue risk associated with a change of passenger structure – it is the risk of revenue change because of a change of passenger structure. For example, when the selected groups of passengers (students, pensioners) travel with special fares, an increase in number of those passengers while keeping the total number of passengers causes a decrease in total revenue for providing transport services. The good solution is setting an appropriate pricing policy of transport services. However, it is important to monitor the impact of price changes on the demand, which varies considerably for particular groups of passengers (Gnap et al., 2006). In the SR, the discounted fares known as saver tickets (half price of the full fare ticket) are for young people aged from 6 to 15 and students to 26, and fares known as "other fares" are for :
 - senior citizens over 70 (€ 0.20 per every 50 km),
 - severely disabled people (half price of the full fare ticket),
 - parents travelling to visit their physically or mentally disabled, chronically ill children nourished in special facilities in the SR (half price of the full fare ticket).

The public passenger transport fare is regulated by public authorities that decide which specific groups of passengers will be entitled to the reduced fares; and, therefore, the revenue risk associated with the change in passenger structure can be classified as the risks associated with interventions by public authorities.

Based on the above analysis, it can be stated that the most passengers leaving public passenger transport system are those who have an option of other means of transport, mainly a passenger car. This group consists of the passengers travelling for full fare. Students who usually do not have the option of travelling by a passenger car, and they are subjected to compulsory school attendance, remain as the users of public passenger transport. Similarly in case of pensioners, the transition to individual motoring is limited at present. Therefore, the need for increasing public funding can be expected because the current trend of increases in number of passengers travelling with special fares persists and these fares bring lower income for operators in comparison with the full fares.

The contract between authorities and operators must be concluded according to the risk allocation between contracting parties. There are following contract forms (van de Velde, 2008):

- The operator bears no risk: in principle, it is called a management contract according to which the authority

bears the cost as well as revenue risk and thus operator bears no risk.

- The operator bears cost risk: so-called a gross cost contract. In this case, the operator bears the production cost risk and the authority assumes revenue risk.
- The operator bears both risks (cost and revenue risk): so-called a net cost contract where the operator assumes both types of mentioned risks and the authority bears no risks.

Table 2 shows the cities in which operators bear the cost risk (authorities assume the revenue risk) or operators bear both risks.

The risk is also possible to allocate between the contracting parties in a certain share (no matter whether cost or revenue risk):

- Full allocation of the risk to one of the contracting parties (the risk from difference between anticipated costs and actual costs spent as well as difference between anticipated revenue and revenue actually achieved).
- Shared allocation of the risk from difference between anticipated and actual level of costs or revenue. A certain percentage of the risk is allocated to each party, for example, in ratio 50/50.
- Pro rata risk allocation to a certain limit (e.g. the operator bears revenue risk up to the level of € 100 000 and the risk above that level is divided proportionally – 50 % to each party (van de Velde, 2008).

Table 2. Allocation of Cost and Revenue Risk to the Operator

Operator Bears	Cost Risks	Krakow, Innsbruck, Rome, Dublin, Gifhorn, London, Oviedo, Elmshorn, Frankfurt, Halmstad, Munich, Stockholm, Warsaw
	Cost And Revenue Risks	Amsterdam, Barcelona, Brussels, Budapest, Dijon, Gifhorn, London, Lyon, Parla, Porto, Santiago, Trieste, Grenland, Haarlem, Manchester, Sondrio, Sundsvall, Wittenberg

Source: van de Velde (2008) and Poliak *et al.* (2012)

3. Approach of Operators to Various Contract Forms

From the position of public authorities that plan funds for providing public transport services, the net cost contracts appear to be the most advantageous. Under this contract form, all the risks, cost and revenue, are borne by operators. The authority pays to the operator a financial amount that is fixed determined at the beginning of a contract period and stated in the contract. In this case, the public transport services in a given area are provided only by the selected operator through a license. The operator has the option to set the level of fares because he also assumes revenue risks.

The gross cost contract is advantageous for operators because they do not bear the risk of revenue decreases which is usually associated with the factors that cannot be influenced by operators.

Based on mathematical modelling of a price regulation and determination of the business reasonable profit in network

industries, Fendeková, E and Fendek, M (2010), they mathematically model an approach of the enterprise in a regulated sector and they define two approaches that can be applied in providing public transport services:

- Approach of the enterprise applying return on investment – the approach encourages the enterprise to use a high volume of capital in order to achieve the maximum permitted reasonable profit. The enterprise has no incentive to use more efficient combination of inputs, e.g. supporting employment in comparison with an end in itself investment in facilities.
- Approach of the enterprise applying increasing the volume of outputs – in this case, if the authority does not have the possibility or manpower for verifying effectiveness of providing public transport service, the operator will seek to realise also inefficient performance.

The mathematical cost modelling applicable to providing public transport services can be also found in the studies of Zhanbirov and Kenzhegulova (2012), and Sharma and Swami (2012).

3.1 Approach of Operators to Gross Cost Contracts

Operators assume all cost risks under gross cost contracts in providing public transport services, whereas, authorities bear revenue risks related to a decrease in the number of passengers. Documents for optimization of public transport services are available for the operator and in case that the authority does not have sufficient access to the data about the number of passengers on particular bus routes he is not able to optimise public transport services. It is necessary to continuously optimise providing public transport services when the number of passengers decreases. In terms of business interest, the operator who bears no revenue risk is willing to operate also the buses without any demand because the authority bears the risk that bus will not be used by passengers. For example, if there was abolition of a production plant into which the operator provided transport services for employees and the authority did not change a transport license, the operator would continue in providing transport services because a decrease in revenue (in this case to the zero level) would be compensate by the public authority assuming revenue risk.

This approach assumes that a fare level is also determined in the public service contract. The deficiencies of such contracts may be addressed by a contractual clause based on which the authorities have an access to the electronic data on the number of passengers in real time and thus they can obtain materials to optimise the transport services.

3.2 Approach of Operators to Net Cost Contracts

Under these contracts, the operators assume not only cost risk but also revenue risk related to providing transport services. The authority grants a license for providing public

transport services to the operator that is then entitled to provide public transport services in the given served area with an exclusion of other operators (during the license period). As follows from the analysis processed by van de Velde (2008), the net cost contracts are rarely awarded as route contracts because the operator determines a fare level and he becomes a monopoly for providing public transport services in a given served area during the licence period. The following mathematical model defines a procedure of such operator in relation to providing transport services.

Assume that the operator is a company that aims to make a profit. Based on the license and the public service contract – net cost contract, the operator provides a range of transport services bounded by demand of q . Start from a general assumption which is acceptable in any type of a market structure, the consumption of a product offered in the market is described by a price – demand function that expresses willingness of a consumer to buy q units of services provided at given price - p .

$$p = p(q) \quad (1)$$

Technological conditions of the operator are expressed through the real cost function

$$n = n(q) \quad (2)$$

The equation presents the amount of minimum costs of n which are spent by a producer in the production of q units of goods, while it is assumed that the price – demand function $p(q)$ is continuous and a twice differentiable real function. It is also envisaged that the price – demand function of the consumer is constructed in order to clearly motivate the consumer to buy q units of services at market price – p because the consumer feels the maximum rate of usefulness from consumer strategy realization in this combination of price and demand. Analogously, the cost function describes a process of providing services by the operator so that quantifies the minimum of total production costs – n for an optimal combination of production factors required to produce q units of provided services.

While optimal consumer behaviour is described by the price – demand function $p(q)$, the optimal operator's behaviour is described by a profit function $\pi(q)$ which is formulated as the difference between revenue and costs of company corresponding to a certain production volume of q :

$$\pi(q) = r(q) - n(q) \quad (3)$$

where a continuous and twice differentiable real function of company revenue $r(q)$ is defined as the product of price and supply volume, i.e. :

$$r(q) = p \cdot q = p(q) \cdot q \quad (4)$$

A company operating in every type of a market structure (a competitive company as well as a monopoly) seeks in a decision-making process such a combination of price and supply of its product that guarantees a maximum level of the profit. This means that the operator also provides transport services in such a way that ensures the maximum profit. Analytically, this approach can be expressed as follows:

$$\pi(q) = r(q) - n(q) = p(q) \cdot q - n(q) \quad (5)$$

For optimizing the profit function, it is necessary that the function would reach its maximum at a certain point of supply - q , i.e. that the first derivative of the profit function at this point is zero:

$$d\pi(q)/dq = d(r(q) - n(q))/dq = rm(q) - nm(q) = 0 \quad (6)$$

In the equation (6), $rm(q)$ is a marginal revenue function of the operator and $nm(q)$ is a marginal cost function. Based on (6), it can be seen that a company generally achieves the maximum profit for a volume of q when the marginal revenue equal to marginal costs, i.e. a solution to the equation:

$$rm(q) = nm(q) \quad (7)$$

Then, it is possible to calculate such a price - p_p that maximises profit of the operator at the optimal level of supply q_p

$$p_p = p(q_p) \quad (8)$$

In the case of the operator who operates in a non-regulated sector (e.g. long-distance transport), where the competition exists, the approach described in previous relationships (equations) cannot be applied. The operator accepts the price - p_K at the level of his marginal costs and he offers the production volume - q_K at that price (Fendekova and Fendek, 2010). This means that the following relationship applies:

$$p_K = nm(q_K) \quad (9)$$

On the other hand, a monopoly due to its dominant position in the market can influence the price of its product so that to achieve higher profit in comparison with competing companies. The monopoly determines an optimal price - p_M based on the optimization solution (5) and based on relationships (7), (8), that is:

$$p_M = p(q_M) \quad (10)$$

Based on above mentioned, the operator operating in a monopoly position can provide fewer services at a higher price compared to competitors. The approach is shown in Figure 1 based on which the following applies:

$$p_M > p_K \wedge q_M < q_K \quad (11)$$

It can be concluded based on Figure 1 that the operator operating in a competitive market would provide services in a volume of q_K at the price - p_K . If the average unit costs per unit of provided services are defined as:

$$n_j(q) = n(q)/q, q > 0 \quad (12)$$

then the price of provided services will not cover even the average costs of the operator because:

$$n_j(q) > p_K \quad (13)$$

If the operator provides public transport services in such a case, the loss of operator will be at the level of (according to the equation (5)):

$$\begin{aligned} \pi_K &= r_K - n_K = p_K \cdot q_K - n_{jK} \cdot q_K = \\ &= (p_K - n_{jK}) \cdot q_K, \quad n_{jK} > p_K \end{aligned} \quad (14)$$

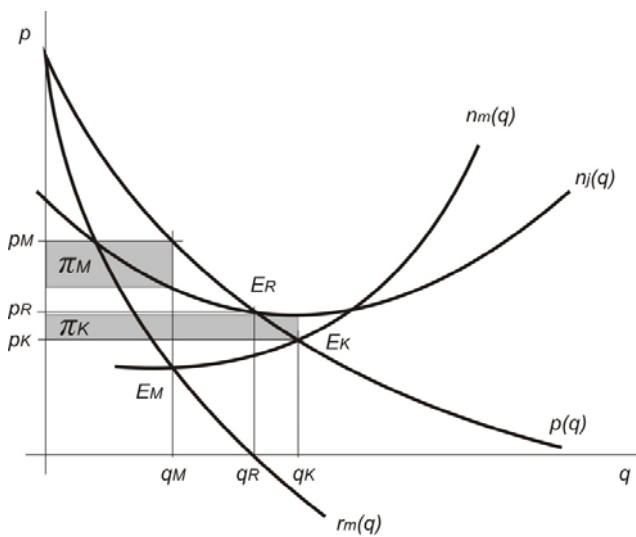


Figure 1 Monopoly and competitive company; Source: processing by authors

If the operator acted as a monopoly in the same market, he would provide public transport services at the level of q_M at price - p_M and he would achieve, under these conditions, a profit - π_M at the level (Figure1):

$$\pi_M = r_M - n_M = p_M \cdot q_M - n_{jM} \cdot q_M = (p_M - n_{jM}) \cdot q_M \quad (15)$$

because the following applies for the monopoly:

$$p_M > n_{jM} \quad (16)$$

4. Conclusion

The authors conclude that while providing public transport services the operator in a monopoly position achieves higher profit in comparison with the operator who operates in the market of perfect competition. If the public authority decides on a net cost contract, according to which the providing transport services is in the competence of the operator, there will be the risk of lower quality or the risk of lower performance than in comparison with the case of a gross cost contract.

The public authorities tend to issue a license for one operator to provide public transport services for whole served area and consequently to conclude a net cost contract. Under this contract, the decision on an organization of public transport service including pricing is in the competence of the operator. However, it is important to note that this procedure can lead to reducing quality of providing services.

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NOTES

- Note 1. Public service contract for urban bus transport in city of Bardejov – the reasonable profit is 5 % during a contract period (the contract is valid until 31.12.2018).
- Note 2. Public service contract in urban transport between BKV operator and city of Budapest; 2008.