

## **EVALUATING URBAN BUSES PERFORMANCE: A COMPARATIVE ANALYSIS OF BRAZILIAN METHODOLOGIES**

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### **ABSTRACT**

Brazilian urban buses are operated by private enterprises under administrative contracts to local transport authorities. Usual contract duration is five-to-seven years, but competitive re-tendering may be avoided through a renewing option to be applied if incumbent presents a good performance. In some cities, however, federal mandate of compulsory tendering begins to be followed. In the two cases, some local authorities have developed methodologies for evaluating operators' performance. In this paper, we analyse methodologies being used in two Brazilian local bus systems — Recife and Belo Horizonte —, with the objective of verifying their ability to induce competitive behaviours in the operators and their fitness to local authorities' goals. Conclusions show that examined evaluation methodologies are limited mechanisms concerning the achievement of objectives like competitiveness, improvement of service quality and productive efficiency.

### **INTRODUCTION**

In Brazilian urban and metropolitan areas, buses are the most important mode of public transportation, frequently the only one. Even in Rio de Janeiro and São Paulo, where underground and suburban trains have a relatively stronger presence than happens in any other Brazilian metropolis, buses' market shares are over 80%. As car ownership is not too extended, the great majority of Brazilian urban population depends heavily on buses to satisfy their day-to-day mobility needs and, consequently, urban social and economic dynamics is tightly linked to buses' efficient performance. As close substitutes are generally unavailable, Brazilian local bus markets were traditionally considered as a field for exercising strict public regulation (Orrico & Santos, 1996). Regulatory policy options and strategies has been implemented since the fifties, when trams, by several reasons, went into a deep crisis and a growing bus industry emerged as a hegemonic successor (Santos & Brasileiro, 1996).

Constitutionally defined as a public service, Brazilian local buses are predominantly operated by private enterprises under administrative contracts (concession contracts) to local transport authorities — municipal or metropolitan agencies (Aragão & Marar, 1996). Although each local authority has the responsibility for laying down its own public transportation statute, main characteristics of local regulatory policies are the same all over the country (Orrico et al., 1996). Besides the fact that Federal Laws on public service concessions establishes certain general rules to be followed, homogeneity in local bus regulations is explained better by historical reasons.

From fifties to seventies, regulation of urban bus markets was a matter of municipal Governments (Santos & Brasileiro, 1996). In the seventies, as an answer to the imbalance between growing urbanisation rates and deteriorated and dysfunctional urban environments, Federal Government intervened in Brazilian metropolitan areas and main cities with the objective of improving urban public services and infrastructures. In what concerns to transit institutions, Federal action emphasised the modernisation of public-private relationships by means of restructuring local transport agencies and promoting private business concentration (Brasileiro et al., 1997).

From the beginnings of the eighties, exclusive route-by-route concession contracts follow strictly the *public service* approach. Public agency would design network and define, for each route, vehicular capacity, stops, timetable and operating fleet. More over, public agency establishes fares and general standards of service quality. Private operators have the only duty to running buses according to public agency's prescriptions, being paid for in a *standard cost-plus* basis, with a fixed rate-of-return on immobilised capital. Total system costs are to be equalised by fare revenue with no public subsidy.

Contracts are generally defined to expire in five years, when the services conceded should be re-tendered. Nevertheless, they usually present a renewing clause to be applied since the incumbent has presented a “satisfactory” performance (Orrico & Santos, 1996). In fact, although the need for evaluating operator's performance is recognised in every local transport statute and concession contract, just a few local transport authorities in Brazil has developed and implemented some sort of methodology for systematically performing it (Santos, 1998).

In this paper, after characterising Brazilian urban bus regulation, we analyse performance evaluation methodologies being used in two local bus systems in Brazil: those of Recife and Belo Horizonte. Firstly, each methodology is described, as well operational and regulatory context. In a third section, the mathematical model used in each methodology is discussed. The next section examines both methodologies against regulation objectives as well as the goals posed to evaluation. A fifth section explores the results of evaluation rounds in Recife and briefly works on first results of Belo

Horizonte. Finally, conclusions are done concerning potential improvements in the methodologies and the transferability of experiences to other Brazilian systems or to distinct regulatory environments.

## EVALUATION METHODOLOGIES, REGULATORY AND OPERATIONAL CONTEXTS

This section is dedicated to briefly describe the methodologies of performance evaluation used in Recife and Belo Horizonte, as usual as to discuss their main mathematical features. Moreover, main characteristics of local regulatory and operational contexts are presented with the objective of establishing a basis for the analysis to be carried out in next sections.

### Recife

Recife, the capital of Pernambuco State in Northeast Brazil, is the nucleus of a statutorily defined Metropolitan Region joined by other twelve municipalities. As a whole, Metropolitan Recife has a population around 3 millions inhabitants. Working day trips by public transportation sums up to 2 millions, divided into buses, trains and unregulated vans. Modal split is as shown in Table 1.

**Table 1**

Metropolitan Recife – Public transportation modal split in a typical working day (1996)

Modes	Thousand trips	Modal market share	Intramodal market share
Buses	1,705	86.5%	—
<i>EMTU network</i>	1,505	76.4%	88.3%
<i>Other local networks</i> <sup>1</sup>	200	10.1%	11.7%
Trains (CBTU)	116	5.9%	—
Vans	150	7.6%	—
Totals	1,971	100.0%	—

*Basic data sources: EMTU and CBTU (Brazilian Urban Trains Company)*

<sup>1</sup> *Some municipalities in Recife Metropolitan Region have internal bus networks.*

Concerning to buses, around 1.5 millions of daily trips are made in the network regulated by EMTU — Urban Transportation Metropolitan Agency (in Portuguese, *Empresa Metropolitana de Transportes Urbanos*), comprising inter-municipal and Recife's internal routes. EMTU is the urban transportation state authority, founded in 1979 following federal policy directives. Twenty-one operators produce services designed by EMTU. Twenty are private firms and the last is a public enterprise owned by the municipality of Recife, now going through a privatisation process. The size of private operators ranges from 18 to 410 registered buses (total fleet size in 1996 was 2,515; average fleet size was 120 buses).

Fares are annually calculated in such way that total fare revenue must be equal to total (operational and capital) costs. So, fare equals costs divided by expected number of paying passengers. Operators

are paid for services produced accordingly to a two-fold procedure: 60% of total costs are a fixed reimbursement; the remaining 40% are affected by operator's ridership efficiency factor  $\theta = \text{realised IPK} / \text{expected IPK}$ , where IPK stands for the rate of paying passengers by kilometres produced and  $\theta \in [0.97; 1.03]$  (GEIPOT, 1999).

Concession contracts have been awarded by means of a non-competitive negotiation process conducted in the late seventies. Then, previous incumbents — usually little familiar businesses — were induced to merge into greater and more organised firms (Brasileiro & Santos, 1999). During the eighties, 5-years long contracts have been renewed in an automatic manner. From 1991 on, EMTU has laid down a performance evaluation methodology in order to support contract-renewing decision, as well as contract breaking off.

Each operator's performance is evaluated biannually according to six criteria (fleet medium age; depot facilities; fitness to prescribed timetables, fleet and estimated ridership; users' complaints; administrative penalties; fitness to fleet renewing policy and expected fuel consumption). For each criterion, there is a set of sub-criteria and a valuation function is applied to determine a 0-to-10 partial score.

Operator's score for the semester is then calculated as a weighted average of criteria scores (0.1; 0.05; 0.4; 0.1; 0.15 and 0.2 are the weights for the six criteria). Scores under a 5 are considered to be bad results. Two successive or four not-successive bad results are sufficient reasons for EMTU to cease operator's contract. Furthermore, operator's performance over contract life is evaluated by computing average score: reasonable (5-to-7), good (7-to-9) and excellent (9-10) grades are linked to contract renewing for 3, 4 or 5 years. Average score under 5 implies that contract with the operator will not be renewed and those services shall be put to tender.

### **Belo Horizonte**

Capital of Minas Gerais State, in Southeast Brazil, Belo Horizonte has a population around 2 million inhabitants. Although the municipality joins a statutory Metropolitan Region, its internal urban bus network is, since 1993, fully designed, regulated and managed by a local authority, BHTRANS (Belo Horizonte Transport and Traffic Agency — in Portuguese, Empresa de Transporte e Trânsito de Belo Horizonte). The totality of bus services are presently produced by forty-eight private operators, ranging from 9 to 154 buses (in April 1999, total fleet size was 2,977; average fleet size was 62).

Besides BHTRAN buses, urban transport in Metropolitan Belo Horizonte is supplied by an inter-municipal bus network connected to internal routes in the remaining municipalities (managed and

regulated by Minas Gerais Public Roads Department) and suburban trains. Modal split is as shown in Table 2.

**Table 2**

Metropolitan Belo Horizonte – Public transportation modal split in a typical working day (1996)

Modes	Thousand trips	Modal market share	Intramodal market share
Buses	2,700	97.6%	
<i>BHTRANS network</i>	1,800		66.7%
<i>Remaining networks</i>	900		33.3%
Trains (CBTU)	65	2.4%	
Totals	2,765	100.0%	

*Basic data sources: BHTRANS and CBTU (Brazilian Urban Trains Company)*

Until 1997, just like in the case of Recife, concession contracts have once been awarded in a negotiation process in the late seventies and were automatically renewed each five years period. In that year, according to a decision of Minas Gerais Accounting Court respect to Federal Act 8987/95 mandate of compulsory tendering, BHTRANS put to tender its entire network (Cançado et al., 1997). Contractual rules establishes that winning firms will have the right to operate a certain number of buses in routes elected by BHTRANS but previously unknown by bidders, for a ten-years period. Periodic firms' revenues would be calculated and paid on the basis of a previously informed kilometric cost sheet, but public authority retains 1% of monthly total payments, which are distributed into operators according to their evaluated relative performance. Another 1% of payments are affected by a relative ridership efficiency index  $\phi$  that measures the variation of operator's IPK (present month respect to last trimester) normalised by the variation of the entire network's IPK (BHTRANS, 1997).

BHTRANS' Operational Performance Index (OPI) evaluates operators' performance on a mensal basis. For each operator, BHTRANS computes five partial indexes: administrative penalties; fitness to trips prescriptions; uncompleted trips due to mechanical failure; detected problems in inspections; users complaints. Every index formula is designed to give the best result the largest figure. These indexes are adjusted respect to others operators' results by means of the general equation  $I_{adj} = 100 [(I - I_{min}) / (I_{max} - I_{min})]$ . After that, adjusted indexes are combined linearly — weight vector is (0.2; 0.3; 0.25; 0.15; 0.1), in the same order as in criteria list above — to obtain mensal OPI for each operator. But the IDO used monthly by BHTRANS to distribute prizes is actually the operator's average IDO in the last three months

## ANALYSING THE MATHEMATICAL MODELS

As above descriptions has shown, mathematical models adopted by EMTU and BHTRANS are affiliated to the family of linear multicriteria models. It implies that both models have compensatory

characteristics, meaning that a bad partial result in a criterion may be overcome by a better one in any other criterion. Certainly, compensations are influenced by relative weights and then specifying weights (trade-offs) is a crucial duty in the construction of such methodologies (Voogd, 1983).

Complete information on how the weights vector was defined in each case is not available, but it was possible to know that criteria and weights were discussed by technicians in EMTU and BHTRANS, including some consultation to operators, in a somewhat informal manner, and with no support of some group decision method. So, both authorities opted by an informal consensus construction in which concerns to relative weights, as well to their respective sets of evaluation criteria (Santos, 1998; Cançado et al., 1997).

Comparing the sets of criteria and sub-criteria adopted in each case, it is possible to identify a common emphasis on operational management. To BHTRANS, only operational performance are considered and every criteria is linked to operational prescriptions or rules laid down by BHTRANS itself. In the case of Recife, EMTU shows the same concern about operators' fitness to statutory or service rules. Nevertheless, the ruling and prescribing praxis undertaken by EMTU is extended to comprise operators' patrimonial policies. Due to this, in the set of criteria evaluated by EMTU there are operations-related — close to those used by BHTRANS, except for results of vehicular inspections — and patrimony-related ones: fleet medium age and fitness to fleet replacement policy ordered by EMTU, and availability of depot facilities.

The fact that both evaluation procedures, in general, reflect just fitness to public authorities rules and prescription is due to strict controlling and commanding fashion of urban bus regulation in Brazil: as operators have no chance to exercise their skills in tactical features (in the sense proposed by Van de Velde, 1997), performance evaluation relies upon their ability to following public authority decisions on network design and operation.

The only exception to this general character of criteria is users' opinion. In both models, this criterion is weighted by 0.1, which shall be considered a short weight. EMTU and BHTRANS justify the fact with the same argument: there is no way of guaranteeing objectivity on these grounds (Cançado, 1998; Santos, 1998). Both authorities register users' complaints by means of telephone calls, letters or formalised denunciation. But in a country where citizenship is not extended, especially between the captive users of local buses who are the poorest members of the population, and some public facilities as public telephones are sometimes hard to meet, the argumentations posed by both authorities are acceptable.

The ways in which criteria scores are computed by both models are such that operator's partial evaluations may be understood as a goal achievement level. The concept of goal achievement has a

long tradition in the field of multicriteria evaluation in transportation, beginning with the seminal work of Morris Hill on the goals achievement matrix (Voogd, 1983). In the model used by EMTU, partial level of performance is absolute and concerns to a previously defined (then, exogenous) benchmarking. Valuation functions are such that intervals of operator's partial performances are assigned to a quantity of points between 0 and 10 (step-by-step functions). It means that for each sub-criterion it was needed to define different levels of goal achievement. Moreover, for each level of goal achievement, an interval of indistinguishable performances was assumed. So, improving evaluated partial performance means to surpass a threshold, the upper limit of a particular interval. As upper limits does not change, it is possible to an operator to formulate managing or patrimonial policies for improving his general evaluation, even comparing expected improvements against the costs of implementing such policies. So, operators in Recife are asked to do things better than a standard satisfactory firm. Effective pressure on operators really exists if the standards purposed by EMTU are as high as sufficient to require managerial efforts and operational cares from the incumbent.

On its turn, BHTRANS' score-computing procedure for each criterion assumes an endogenously defined benchmarking, in the sense that partial scores got by each operator depends on the behaviour of the whole set of operators concerning to each particular criterion. The continuous scaling process adopted by BHTRANS implicitly supposes that an improved partial performance means a farther performance from the worst one. So, general performance improvements do not depend solely on each operator's behaviour but also on the behaviour of the operators with the worst partial performances. So, incumbents in Belo Horizonte are asked by BHTRANS not to be between the worst operators and, in this context, effective pressure actually exist if the set of operators comprises firms with more or less the same managerial ability. If not, getting a high (low) score may simply means that operator is not as so able (unable) as some of incumbents.

In what respects to differentiability between performances, BHTRANS' methodology presents some more consistency than EMTU's one, in the sense that continuous scaling provides *natural* differentiation and, in addition, sprawls the differences between partial scores. The problem here with the methodology adopted by EMTU is two-fold: firstly, the use of intervals of performance direct measures assigned to a same level of goal achievement reduces differentiability; secondly, sharp discontinuity of goal achievement level in the extreme points of each interval produces a *not-natural* differentiation in the scores.

## **DISCUSSION ON METHODOLOGIES AND OBJECTIVES OF REGULATION**

These differences between methodologies shall be explained by the general objectives traced for the evaluation procedures. In both cases, a general stated objective is the incorporation to public management of bus networks a systematic tool for assessing operators' performance. Nevertheless,

performance evaluation may be seen as a mechanism for introducing desired elements of competition in exclusive concession contracts (Santos, 1998), specially where contracts life is long and the positive effects (Cox et al., 1997) of re-tendering may be avoided by incumbents, or when contract renewing is object of negotiation and re-tendering is not compulsory.

In Recife, where contracts have never been put to tender, the main idea was to induce some kind of competitive behaviour among the operators by means of threatening them with possible contracts breaking off or, at least, reduced renewing periods (GEIPOT, 1999). It is worthy mentioning here that competitive pressures of a real kind may be felt by Recife operators due to the presence, in some parts of the network, of vans, unregulated low capacity vehicles offering a very low quality service at the same fares as regular buses.

In Belo Horizonte, the stated reason for using an evaluation methodology was to make the operators “partners of BHTRANS in the effort of improving service quality”, because being paid for with no reference to actual ridership would have made operators uninterested in fulfilling users’ needs (BHTRANS, 1999). It is remarkable that, in Recife, this partnership is intended to be achieved directly only by adopting the ridership efficiency factor  $\theta$ , and then performance evaluation seems to be a more strategic mechanism for inducing positive behaviours in the medium or long term.

On the other side, policy options made by public authority in Belo Horizonte avoid any kind of threatened competitiveness, except in the short term, with operators mutually trying to get better periodic scores in order to receive pecuniary prizes. It should be noted that prizes or penalties in both cases respect to no more than 2%, in Belo Horizonte, or 1,2%, in Recife, of expected reimbursement values. With these figures in mind, and observing that standard cost sheets, due to asymmetric information, may estimate costs well in excess of real production costs (Orrico & Santos, 1996), it is reasonable to think that this kind of penalty is not as strong as needed to put a positive pressure on operators.

So, options made by EMTU seem to be more adequate in order to force the incumbents in better fitting operational results to those prescribed by public authority. However, it is worthy noting that threatened competitiveness in the case of Recife is really linked to a pressure on the operator in obtaining each six months a overall score greater than 5.0 in order to be awarded with a contract renewal. After all, Brazilian urban bus regulation has been appointed as a typical case of captured regulation (Orrico et al., 1996; Santos & Orrico, 1998) and it is clear that, in a regulatory context essentially oriented to protect incumbents from commercial risks or even potential competitors, it is difficult to succeed in implementing pro-competitive mechanisms.



If benefits are not so extended, some doubts may be risen concerning to the cost-efficacy of both enforcement policies. Although there are statutory mandates ordering EMTU and BHTRANS to perform periodical evaluations of concessionaires' behaviour, the kind of evaluation methodology adopted in both cases requires a very costly database, either to collect as to work on. Both methodologies suppose no sampling techniques and all relevant data must be collected and fed into the database. Some data are received from the operators and compared with on street or on-depots observations made by public authority officials.

Certainly, some of these data are needed to produce in order to proceed the usual calculations referred to actual production and ridership, crucial informations to compute revenues to be paid to operators. But the existence of such an evaluation methodology is responsible by some new costs, including new transaction costs due to discussion between principal and agents respect to data used in evaluation. Of course, computational implementation of evaluating model is very simple and this is a merit of linear multicriteria methods. In a near future, the use of automatic vehicle identification as well as smart cards will make less expensive the procedures of data gathering. Until this time arrive, however, costs incurred by public authorities in the process of collecting data, checking them, computing and finally publishing results should be carefully analysed and compared to improvements in service productivity and quality.

## **ANALYSING EVALUATION RESULTS**

One way of verifying the positive impacts of performance evaluation on general service quality is to monitor the scores obtained by operators in successive rounds of methodology application. This procedure may be fully used in the case of Recife, from which periodical evaluation results are available since 1991. Furthermore, between 1991 and 1996, bus services in Recife were reasonably stables, without significant changes in the set of operators or in the operational environment. Concerning to Belo Horizonte, full use of evaluation methodology begun in January 1999, with some simulation rounds being made during 1997. But the tendering of the whole set of services in 1997 brought deep changes in the operational context as well as some less important alterations in the set of operators. Due to this, this section is devoted more in-depth to analysing the case of Recife, although some explorations are made concerning the case of Belo Horizonte.

### **Recife**

Table 3 shows how distribution of operators by grades evolved in twelve rounds of the methodology. From 1991 to 1992, 19 operators were running services to EMTU. In 1993, they were 20 and from 1994 on, 21.

It may be observed in Table 3 that, from the first to fifth or sixth round, the proportion of operators obtaining excellent results rose quickly. After the rounds of 1993, however, this proportion shows a decreasing trend. If excellent and good results are considered together, a proportion of 100% may be observed to have been reached in the year 1992. Since then, there is a decreasing trend in the excellent-or-good proportion, although in the rounds of 1996 there seems to be a reversion on this trend. In the bottom of Table 3, figures reveal that operators with bad results are more common in the last rounds than in the first ones. The same applies to regular results. These trends seem to show that evaluation methodology adopted by EMTU is not being able, in the long term, to induce permanent efforts on every operator as to perform above defined benchmarking.

**Table 3**  
Percentage of operators by received grade (1991 a 1996)

Grades	91/1	91/2	92/1	92/2	93/1	93/2	94/1	94/2	95/1	95/2	96/1	96/2
Excellent	10.5	26.3	36.8	63.2	35.0	45.0	38.1	19.0	23.8	4.8	19.0	9.5
Good	73.7	68.4	63.2	36.8	60.0	50.0	47.6	52.4	38.1	47.6	52.4	66.7
Regular	10.5	5.3	0.0	0.0	5.0	5.0	14.3	23.8	23.8	42.9	19.0	14.3
Bad	5.3	0.0	0.0	0.0	0.0	0.0	0.0	4.8	14.3	4.8	9.5	9.5

*Basic data source: EMTU*

*Observation: 91/1 refer to the first round of 1991; 91/2 to the second round and so on*

In fact, further examination of overall scores obtained by operators shows that average score trend to decrease. For the rounds between 94/2 and 96/1, average score is 7.37; taking in account all the rounds between 91/1 and 96/1, average score is 8.11. Just two operators has a better average evaluation score in the rounds 94/2 to 96/1 compared to the rounds 91/1 to 94/1. Standard deviation rises from the first to last round, as well as normalised (by the mean) standard deviation. Comprising the analysis to the last four rounds, 12 operators denote a decreasing trend in their scores. These figures indicate that evaluation conducted by EMTU does not force operators to improve performance, at least measured performance.

Trying to get insight on which criteria are more significant to explain the overall score decreasing, an analysis on the criteria score level was performed. It was observed that fitness to prescribed timetables, fleet and estimated ridership, users' complaints and administrative penalties (joint weight: 0.65) are those which registers decreasing scores. On the other side, fleet medium age and depot facilities (joint weight: 0.15) shows a increasing score, while the last criteria — fitness to fleet renewing policy and to expected fuel consumption — scores remain more or less constant. It is remarkable that criteria showing decreases in score are exactly those of an operational-type and, on the other hand, increasing scores criteria are of a patrimonial-type. More curious, the only constant score criteria is one that mixes patrimony-related issues (vehicle replacement policy) and operations-related ones (fuel consumption).

These findings seem to show that, after a first phase when they tried to improve performance as a whole (1991-1993), operators are no more excessively worried about evaluation results: once a good position is achieved, they rely on patrimonial policies to sustain results. Surely, this is not explained solely by performance evaluation: as fleet replacement and medium age reducing also alters costs computed by EMTU to pay for services produced, the strategy is quite interesting for the operators.

With the aim of testing further this hypothesis, a computation of normalised absolute deviations for each operator and criterion score was performed, considering average criterion score in the rounds between 94/2 and 96/1. The central idea is that operations-related criteria are somewhat more random than patrimony-related ones. It was found that absolute deviation is higher for former criteria (8% for administrative penalties, 15% for fitness to prescribed timetables, fleet and estimated ridership and 57% for users' complaints) than latter ones (12% for fleet medium age and 5% for depot facilities). These results support the hypothesis that general behaviour between the operators, after getting a satisfactory position, is to neglect about operations-related criteria.

In other direction, it seemed important in this study to verify the existence of score differences due to the size of operators. A partition of the set of operators was made in such a manner that a first group was joined by 5 operators with an assigned fleet to services contracted by EMTU over 200 buses. A second group was composed by 6 operators with more than 100 and less than 200 buses in the EMTU's network. Ten operators with less than 100 buses remained in the third group. Table 4 shows for each group the average overall score in each evaluation round, as well as an average overall score for all the rounds (Column Mg) and for the last four rounds (Column M4). As in Recife there is a relatively big state-owned bus enterprise, results for the first group were obtained with and without taking in account this operator.

**Tabela 4**  
Average overall scores by groups of operators

Groups	91/1	91/2	92/1	92/2	93/1	93/2	94/1	94/2	95/1	95/2	96/1	Mg	M4
Top-5 <sup>(a)</sup>	8.3	8.5	9.1	9.1	8.7	8.7	8.4	7.5	7.4	7.0	7.4	8.2	7.3
Top-4 <sup>(b)</sup>	8.4	8.6	9.2	9.3	8.9	9.0	8.9	8.6	8.1	7.3	7.7	8.6	7.9
Medium firms	7.7	8.2	8.2	8.9	8.1	8.0	7.7	6.6	6.5	6.5	7.2	7.6	6.7
Short firms	7.8	8.3	8.9	9.0	9.1	8.9	8.8	8.2	7.8	7.2	7.9	8.4	7.8

Note: <sup>(a)</sup> including the public enterprise; <sup>(b)</sup> excluding the public enterprise

It is remarkable that decreasing score trends are approximately the same for every group ( $M4 < Mg$ ). Systematically, the group joined by the medium size operators has the lower average score. The group with the shortest operators has more or less the same results as the Top-4 group. Public operator has a performance scored well under its partners in the Top-5 group. These elements show that there are no

differences between short and big firms concerning EMTU's methodology of performance evaluation. But the fact that medium size operators have the lowest score may not be explained without developing case-by-case studies.

### **Belo Horizonte**

The methodology used in Belo Horizonte supposes no exogenous benchmarking. Partial scores obtained by operators are parameterised respect to worst and best scores before being summed up in a single figure. Due to this, current parametrical statistics are not good tools for analysing such results. Nevertheless, it was tried to extract from the data available some information in order to test hypothesis on BHTRANS' model presented in previous sections.

Firstly, the ability to differentiate between operators is clearly a great advantage of this methodology. In the round of the first trimester of 1999, maximum IDO was 90.2, minimum IDO was 29.2 and average IDO was 68.2. This suppose a really larger range than it would be normally obtained by EMTU's methodology. Standard deviation is 11.5, representing 17% of the average. Twenty-eight operators got an IDO above the average.

There is a low correlation between fleet size and IDO (about 16%). Searching for some relationship between size and IDO, the set of operators was divided into four equal groups; the greatest twelve operators, the second great twelve and so on. Average IDO in each group is respectively 70.6; 70.3; 65.7; 66.5. These figures are very near to general average, meaning that there is no bias favouring greater firms in the methodology. Possibly, the fact that BHTRANS did not use any patrimony-related criterion is maybe the reason for these results.

### **CONCLUSIONS**

The analysis of two Brazilian experiences with performance evaluation in bus transit brings some interesting lessons. A first one, maybe the most important, is that both EMTU and BHTRANS were able to develop and implement an evaluation methodology. The fact that EMTU is applying its methodology for 8 years is a noticeable event, mainly in Brazil where political power of bus operators is well known.

But, concerning the objectives of regulation or even the objectives of each methodology, results and findings shown in this paper reveal that:

(a) designed methodologies are very expensive to put in practice, therefore pointing the need for further development in the statistics elements of the problem, especially sampling techniques;

- (b) the relationships between evaluation methodologies and payments made to the operators should be improved in order to make effective short term threatened competition;
- (c) sustainable long term threatened competitiveness seems to be better achieved by means of a systematic procedure of performance evaluation used to support contract breaking off decisions;
- (d) another crucial role performance evaluation should play in pro-competitive regulatory policies is to support decisions on contract renewing, especially when just one renewal is permitted;
- (e) local authorities should apply less prescriptive regulations, opening spaces for the exercise of operators' skills;
- (f) however, more flexibility for the incumbent means more necessity of evaluation performance.

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