The big-bus trap: what formal bus operators could learn from the informal sector

E. Ferriera
Transport Engineering Program/COPPE at the Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

A. Golub
Institute of Transportation Studies at the University of California at Berkeley, Berkeley, California, USA.

ABSTRACT: Full-size buses operated by large, formal bus companies are the norm in Brazil. Over the last 8 years, informal owner-operators organized into cooperatives, generally employing smaller vehicles, have entered the urban bus markets in cities across Brazil, successfully competing with the formal bus firms. Though per-seat costs are higher for the smaller vehicles, significant cost savings result from the organizational form of the cooperatives. This article will explore some of these savings using data from formal bus firms and informal cooperatives in the city of Goiania, Brazil. The cooperative form of organization can be seen to offer some lessons for formal sector operators.

RÉSUMÉ : Les bus de taille normale exploités par les grosses sociétés formelles d'autobus sont la norme au Brésil. Au cours des 8 dernières années, des opérateurs-propriétaires informels, organisés en coopératives, utilisant généralement des véhicules plus petits, ont pénétré les marchés d'autobus urbains dans des villes à travers le Brésil, rivalisant avec succès avec les sociétés formelles d'autobus. Quoique les coûts par place soient plus élevés pour les véhicules plus petits, des économies significatives de coût proviennent de la manière dont les coopératives sont organisées. L'article explorera certaines de ces économies utilisant des données de sociétés formelles d'autobus et des coopératives informelles dans la ville de Goiania (Brésil). On note que l'organisation sous forme coopérative offre quelques leçons aux opérateurs du secteur formel.

1. INTRODUCTION

The cost of supplying public transit services is the sum of many different factors. Among these factors are the various inputs to production: labor, equipment, vehicles, know-how, etc. This article will explore the way the form of production, what we will call organizational form, can affect costs. We will present data from the city of Goania, Brazil, where informal operators using small vehicles successfully compete with formal operators using full size buses. What becomes evident from this case is the importance of the organization of the operators. The typical, herein called formal, organizational form is the multi-vehicle bus company operating one or many different service routes and one or many bus depots and garages. These firms arose from a specific regulatory history that will be described in the next section. The alternative form explored here is owner-operators organized into cooperatives. These cooperatives generally service one or many defined service routes or areas and exhibit a range of variations within the general form of cooperative.

This paper will first present the regulatory background which led to the current typical public transit firm in Brazil. It will then talk about the recent growth of the informal sector and their type of or ganization. The specific case of informality in Goiania, Brazil is then introduced. Cost comparisons are made between operators in the formal bus companies and operators in the minibus cooperatives. A discussion of these costs and where they could be important to the formal bus companies is then made, concluding the paper.

2. HISTORY

a. Concentration in the bus industry

Urban transportation systems in Brazil have undergone extensive changes in the past century. Until the 1930s, most cities relied heavily on privately run streetcars, with buses running on peripheral routes. By the 1950s, urban growth had far overreached the extensive streetcar networks, and the United States-

originated model of expanding rubber-tire and road based technologies combined with suburban rail systems became more attractive to the Brazilian leaders. At this time, most bus services were provided by small artisan-style operators. Rising incomes from the Brazilian "economic miracle" and added road capacities together created a growing demand for urban mobility, and concomitantly, for millions of private automobiles. A fall in demand for public transit, combined with the oil-price shocks in the early and late 1970s led to a period of crisis for the fragile bus industry. In response to this crisis, in hopes of preventing future ones, and in keeping with the magnitude to which every other industrial sector was being developed, national policy began promoting an increase in the size and strength of the bus companies. Mergers and conglomerations of smaller transit companies were encouraged. In the late 70s, new national and state-level regulatory bodies were created to oversee this new and more centralized model of urban transportation administration. Minimum fleet requirements for bus firms were adopted and peaked in 1983 at over 100 vehicles per firm, but were ended in 1994. New methods of fare calculations, route assignments, and terms of entry into the market were created and standardized.

This history has resulted in heavy concentration in the bus industry in Brazil and the form of system management in existence today. In Rio de Janeiro, several firms operate more than 400 buses, and holding companies often control groups of large firms. The largest group controls 1350 buses, which, at roughly 70 thousands dollars per bus, equals close to 100 million dollars worth of buses.

Today, formally provided bus transportation in Brazil is highly regulated. Nearly all services are delivered by private firms operating under service concessions from public agencies. Regulations exist governing fares, routes, schedules, labor rules, curbside operations, market entry standards, maintenance and equipment specifications. For service within one municipality regulations are made and enforced by the municipal governments, and for inter-municipal transport, state governments. Most large metropolitan regions in Brazil are conurbations of multiple municipalities meaning that various regulatory agencies are responsible for regulating public transit of one geographic region. Operating concessions for services are typically granted by route, or packages of routes, to the private firms for a period of 10 to 20 years. Most firms employ various modern labor and fleet management, data analysis, and accounting practices.

Fares are determined in most cities by calculating costs and rewarding some rate of return on capital invested. This "cost-plus" method is obviously interrelated to the regulatory goals of expansion and concentration of bus firms, because it induces investment and overcapitalization. This will be an important issue in differentiating with the informal sector.

b. The growth of informality

The current wave of informal paratransit activity in Brazil began around 1994 and has experienced a steady rate of growth. While various cities in the past experienced growth of informal sectors, the current wave is more national in character. It is having profound effects on the ridership levels of the formal transport systems in many cities simultaneously around the country. By the beginning of 2000, about 70% of cities with populations exceeding 300,000 were experiencing some informal transportation activities. In about 60% of the cities, the informal systems were experiencing growth at that time [NTU, 2001]. Table 1 shows the market shares for larger Brazilian cities surveyed in 2000. Some particular routes or corridors might be even more heavily impacted, and numerous were witness to the complete failure and bankruptcy of the formal operators.

Table 1. Public transit market share of informal operators in cities with populations exceeding 300,000 in 2000 [NTU, 2001].

Market Share of Public Transit Trips	Share of cities
< 5 %	48 %
5 to 10 %	16 %
10 to 20 %	12 %
20 to 40 %	16 %
> 40 %	8 %

These new systems include minibuses, vans, mototaxis and "Kombies." The "vans" typically seat 8 to 12 passengers and are newer Japanese or Korean-made minivans. Vans are used for both neighborhood circulation and suburb to CBD, line haul, services. These routes either compete directly with formal bus or rail routes, might serve areas previously underserved by transit, or behave as feeder services to other formal modes. In Rio de Janeiro, for example, about two-thirds of the vans are owned and maintained by its driver, a quarter are rented from it owners, and the remainder, about 8%, are driven by drivers hired by the owner and paid monthly. For intermunicipal, line-haul services, fares vary by route based on distance, do not include any provision for transfers, and are about 5 to 10% higher than bus fares for the same route. Vans within municipalities charge a flat fare close to the flat fare of the formal buses, and are often times cheaper. "Kombies" are volkwagen vans fitted to seat about 8 and are generally used for local neighborhood circulation or short distance line-haul trips.

c. The informal cooperative

In contrast to the large bus firms described above, informal operator cooperatives come together with rel-

atively little capital invested. Instead, they rely on a careful balance and distribution of risk and investment among members, who then reduce that risk mutually by operating together through the cooperative. Most cooperatives of owner-operators operate one or more lines in a specific region or corridor, or in some fairly well defined area. Based on observation, it seemed that all of the key cooperative organizers were also van drivers or former drivers. The cooperatives help the vans maintain their pick up/drop off space at the downtown terminals, and might help with other services, such as maintenance, securing credit, or getting reduced costs for parts or labor for vehicles. They also protect the routes from piracy by non-member vehicles through threats of force, or sometimes legal action. Of course, belonging to a cooperative can help legitimise van operation in the eyes of new and cautious users, or regulators who are in a process of legalizing services.

Some cooperatives share downtown terminals, and as many as 6 or 7 routes could share facilities. Smaller terminals might each serve only one route. Cooperatives use membership fees to maintain their space in the terminal. The terminals also charge each van entering the facility. The space for each route is clearly marked with a sign displaying the name of the cooperative and the destination of the route, and usually has space for passengers to sit while waiting for the next departing van. The larger terminals have concession stands, public phones and bathrooms for waiting passengers. The terminals' dispatchers help with keeping track of and organizing entering and departing vehicles and keep the terminal running smoothly. The terminals' "chamadores" or "callers" try to lure potential bus riders and other people passing by the terminal area into the vans.

3. CASE STUDY COMPARISON OF COSTS

a. The case of Goiania, Brazil.

Goiania located in the central west of Brazil, and is the capital of the state of Goias. It has a population about 1 million people distributed in 929 Km². The greater Goiania metropolitan area has 1.5 million people and is formed by 7 additional municipalities.

b. Goiania's Public Transport System

Data collected by National Association of Public Transport and other local agencies is summarized in Table 2.

Table 2. The division between buses and minibuses in Goiania.

Goiania	Demand/mo (x1000)	Kms/mo (x1000)	Pass/Km	Fleet
Bus	14,000	6,700	2,09	1029
Minibus	6,400	7,100	0.91	740

Planning, management and enforcement are made by public agency called TRANSURB. Goinias's formal public transport system is formed by 7 bus companies. METROBUS is a public bus company responsible for operations on Aguanguera Corridor Bus Rapid Transit (BRT) line, the 6 other companies run outside the segregated lanes and are responsible for the operation of over 190 lines and 10 terminals.

c. Goiania's Informal Sector

In 1997, Goiania saw the growth of minivans and Kombis transporting people from poorer peripheral areas to the downtown CBD. The operators rapidly organized themselves into cooperatives and the cooperatives set up an umbrella union called SINTRAGO. The strategy of the cooperatives to become legal was to sign contracts with homeowner associations and university students to transport them to center city, which was a way to circumvent formal regulations prohibiting such services. Not all cooperatives used this scheme and many went on operating illegally.

Estimates made by the bus companies showed a demand reduction of about 20% after the informal operators started running. Soon after, the informal sector was recognized as legal and they received the name Alternative Transport. They were required to use 21-seat minibuses (with no standees allowed) instead of vans, and a set number of operating licenses were issued. This number resulted from a bargain between SINTRAGO and TRANSURB and the bus firms. SINTRAGO of course wanted to limit their market, while TRANSURB wanted to please incumbent bus firms, so only 740 permits were issued, though potential demand was seen as much higher.

In 2002, a survey was made with the passengers of all public transport (buses and minibuses) showing that 74% of users of informal operators were satisfied with Alternative Transport while only 52% of bus riders were satisfied with bus services. In all, 58% preferred minibuses over buses.

d. Comparison of Costs

As mentioned before, the cost-plus method is used in almost all Brazilian cities to estimate fares. The informal sector started operation without any kind of fare or cost calculations, as they would attempt to compete with the formal bus services on price. When Alternative Transport was invited to discuss legalization with TRANSURB and SETRANSP, a study of the microbus costs was undertaken in order to estimate proper fares. Table 3 (next page) presents the results of the data collection for that effort. It represents the average of the 7 formal bus companies, and an average of 6 minibus cooperatives in the Alternative Transport system. The formal bus companies were running standard Brazilian 13-meter (45

seats, 85 passenger total capacity), diesel, manual transmission, urban buses. The informal operators were running 21-seat diesel, manual transmission, minibuses. Please note that this data reflects the reporting of the firms and not actual costs measured by independent parties. Because of this, sometimes costs are included in one category for some firms, and other categories for other firms.

Table 3. Typical costs (monthly) for a convention bus company and an informal minibus cooperative in Goania, Brazil.

Type	Conventional	Alternative
Monthly Kilometers per Vehicle	7430	10,755
Variable Costs		
Fuel	0.3979	0.2060
Lubricants	0.0398	0.0206
Tires	0.0398	0.0425
Maintenance	0.1154	0.0675
Total / km	0.5929	0.3366
Total variable costs / vehicle	4,405	3,620
Fixed costs		
Personnel Costs		
Drivers	3,252	2,172
Managers	189	142
Fare collectors	na	na
Maintenance	1,165	na
Dispatch	na	46
Subtotal – Personnel Costs	4,606	2360
Administrative Costs		
Public Taxes	73	na
Consultants	74	na
General Overhead	207	na
Other expenses	105	na
Administration	173	na
Dividends to owners	65	na
Accounting/Human Resources	na	45
Meal Coupons	na	260
Velocity Recording Machine	na	6
Vehicle Washing	na	50
On-board Ticket Reader - Rent	na	120
Cooperative Costs	na	375
Union Costs	na	19
Insurance	300	227
National Vehicle Insurance	25	24
Vehicle Tax	391	54
Subtotal – Administrative Costs	1,413	1,180
Capital Costs		
Depreciation Fleet	1,232	na
Depreciation Equipment	115	na
Remuneration - Fleet	1,150	na
Remuneration - Equipment	345	na
Remuneration - Amortization	35	na
Depreciation Vehicle	na	1,105
Remuneration – Vehicle	na	780
Subtotal – Capital Costs	2,877	1,885
Total Fixed Costs/vehicle	8,896	5,425
Total Costs/ Vehicle	13,301	9,045

na = not applicable

Comparing the costs of these two operators it becomes evident that organization in cooperatives brings some advantages and some disadvantages.

Obviously, the smaller vehicles have lower variable costs, assuming similarly aged vehicles. Fixed costs are broken into personnel costs, administrative costs, and financial costs. The personnel costs differ for several reasons. Drivers in the informal sector are not unionized and are paid less. Both sectors use electronic fare collection and thus does not need fare collectors like. The informal sector does not employ directly its maintenance staff but instead uses local third parties to perform work on vehicles. The informal sector does, however, employ dispatchers along routes and at route ends to organize the less rigid deployment of vehicles into service. In some cities in Brazil, dispatchers are used to control schedules, though in Goiania, they are not.

For administration, the two operations confront very different costs. The insurance and vehicle taxes are higher for buses for obvious reasons, though both types of operations save because they can get discounts on fleet insurance. Union and cooperative costs are part of the costs of maintaining the cooperative and the union of informal cooperatives in the region. Some of the other items in this category were specified in detail for the cooperative but not specified for the bus firm, so some of the items do not correspond between the two.

Under capital costs, bus firms here spend much more than cooperatives on remuneration and depreciation of fixed equipment and goods, which the cooperatives do not have. Any fixed office goods and equipment are rented or leased and included in cooperative costs. The conventional systems have maintenance equipment, tools, depots, garages, rigs and lifts, etc. to remunerate and depreciate.

Totalling all of these costs gives a total monthly cost per vehicle (for a typical number of kilometers). As one would expect for the different vehicles sizes, the total costs per vehicles are different. The per-seat costs are much lower for the conventional buses. For the informal operators, money is saved not only because of the vehicle size, but also because of the lower overhead, capital and labor costs. That is to say that the informal operators could operate buses more inexpensively than the formal operators. The lower overhead costs come largely from owning and maintaining less equipment and having less staff. Capital costs were saved because, simply, the cooperative put forth much less capital – both in vehicles and in fixed goods. Labor costs were saved because cooperative drivers are not unionized and work longer hours etc. (The costs and benefits of these savings will not be debated here, but are recognized by the authors as having other political and social implications.)

4. CONCLUSIONS

This simple case study illuminates some important issues for the organization of bus service operators, especially in developing countries where access to capital and operating revenues is much more limited. The controversy over vehicle size (minibus versus bus) is extensive in the literature and won't be addressed here, but it should be stressed that smaller vehicles, besides their role as transportation devises, are important because they fit within a model of organization that demands less capital. For small operators and artisan-style owners, this is an important point. In contrary to the cost-plus method of fare calculation and remuneration of expenses, cooperatives enter the market to minimize investments, risks and costs, and in doing so, spend less on fixed costs – the costs which are normally rewarded under the cost-plus method. Cooperatives show that the industry can be organized into "lightweight" entities, contracting out all services and bringing into fixed costs and much less capital. By outsourcing parking, maintenance, accounting, and distributing ownership of vehicles among many drivers, large investments are avoided. As large bus firms in Brazil become less and less competitive, for a variety of reasons (competition with the automobile, changing land use and travel patterns, and lower demand per kilometer) the search for cost minimization and new forms of organization should become a priority. Cost-plus methods of fare reward do not lead to competitive operating structures, and should perhaps be reconsidered in this light.

5. REFERENCES

Glaister, S. 1985. Competition on an Urban Bus Route. *Journal of Transportation Economics and Policy*, Vol. 19, No. 1: 65-81.

Glaister, S. 1986. Bus Deregulation, Competition and Vehicle Size. *Journal of Transportation Economics and Policy*, Vol. 20, No. 2.

National Association of Urban Transportation Companies (NTU). 2001. *Transporte Informal no Brasil: Riscos e Propostas*. NTU, São Paulo.

Silcock, D. 1986. Bus or Paratransit: The Issues Involved. *Transportation Planning and Technology*. Vol. 10: 305-322.

Walters, A. 1979. The Benefits of Minibuses. *Journal of Transport Economics and Policy*, Vol. 13: 321-333.