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Is there Competition Between Coaches and Airlines in Brazil?

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Abstract

This paper presents an analysis of inter-modal competition in Brazil by making use of a reduced-form model of coach operators' pricing decisions in the interstate travel market. Interstate travel service is heavily provided by coaches, and the system is fully operated by the private sector under public delegation, through permits and authorizations. Agency-based regulation was introduced in 2002 and this new regulatory framework may stimulate competition in the market; particularly relevant in the new institutional design is the price cap regime that aims at enhancing the flexibility to change fares in response to demand and cost conditions. By analysing pricing decisions of coach operators in some cities within the country, we studied the sensitivity of coach fares to cost components and to air travel fares and therefore investigated whether there is competition with airlines after the regulatory reform. Inter-modal interaction among coach operators and airlines is found to be significant and probably due to the competition for a small set of premium, quality-sensitive, coach passengers.

1. Introduction

This paper aims at developing a reduced-form model of pricing decisions for the interstate travel market in Brazil, in order to investigate potential inter-modal competition. Interstate travel service within the country is heavily provided by coaches, which account for roughly ninety five percent of passengers; travel by plane is nowadays a potential substitute, although air tickets – usually much more expensive relatively to coach travel – are still unaffordable to the majority of coach travellers. We expect that intra-modal interaction among coach operators and airlines may emerge as a result of a competition for a smaller set of premium, quality-sensitive, coach passengers, who may be willing to pay for air travel during airline fare wars.

Inter-modal interaction may be regarded as a relevant issue nowadays, and yet to be further investigated by the literature; notable examples are Wardman (1997), and Ivaldi and Vibes

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(2005). In fact, Wardman (1997) points out that "*relatively little is known about the interaction between modes in the inter-urban travel market*".

The system of interstate travel by coach in Brazil is fully operated by the private sector under public delegation, through permits and authorizations. Agency-based regulation was introduced in 2002 and this new regulatory framework may allow for further advances in competition. A price cap regime was introduced in order to enhance competition among operators, although it is still not possible to set prices below the tariff ceiling without previous communication to the agency.

By analysing pricing decisions of operators in some cities within the country, here we intend to investigate potential price sensitivity to cost components and competitive pressure from airlines; the latter became certainly more relevant after the liberalization of the airline industry, during the nineties, and the recent entry of the low cost airline *Gol Linhas Aéreas Inteligentes*, in January 2001 (Oliveira, 2004, 2005).

The paper is organized in four parts. Section 2 discusses the relevant features of the interstate travel market in Brazil; Section 3 presents the reduced-form model of pricing decisions by coach operators; Section 4 presents the discussion of estimation results; and finally, conclusions are presented.

2. The Interstate Travel Market in Brazil

In 2003, there were 210 interstate coach operators in Brazil. The biggest individual operator, Viação Itapemirim, had a 13.3% share under the passengers times kilometers criterion and none of the remaining operators held more than 7.5% of the market. The Herfindahl-Hirschman Index (HHI), calculated under the assumption of individual operators being independent companies, was 384 and the CR4[1] was 0.31. However, there are major economic groups that own several operators in this industry so that actual concentration is much higher than the values just presented.

The ownership structure is changing rapidly over recent years. Some big merger or acquisition deals are taking place with relevant impact on market structure. For instance, two recent mergers, those of Penha/Pluma, and Cometa/1001/Catarinense, would increase the HHI by 127 points, or 33%, again considering individual operators not grouped up by ownership criteria. The CR4 would increase to 0,337 but it should be noticed that the the impact of mergers in some individual routes that were jointly served by merging operators may be even more significant.

Besides not taking into account the problem of common ownership, overall concentration measures fail to account for the degree of competition that actually takes place in individual routes. Because the service is operated under public delegation, through permits and authorizations, most routes are served by a single operator. Competition is allowed in a few routes, notably the most important ones, including the shuttle service between Rio de Janeiro-Sao Paulo, which carries 0.9 million passengers a year. The latter has competition

[1] Concentration ration for the top four firms in terms of passengers times kilometers.

in prices through discounts below the price cap and also in service attributes, as the route carries many coach travelers and may have an element of price differentiation.

Regulation was transferred in 2002 to ANTT - Agência Nacional de Transportes Terrestres. Scheduled routes are now granted by ANTT through competitive bidding, in a process that requires the signature of a contract of concession. The operation of charter coach services is subject to a more swift process of authorization. The ANTT is taking further steps to enhance competition in markets with more density and is also trying to increase transparency by publishing relevant information such as tariffs in their website. So far the user can get to know the price cap for any route, its frequencies, special attributes offered and some additional information. However, she will not be able to find out whether an operator is offering discounts below the price cap. As Guimarães and Salgado (2003) point out, Brazil has a long way down the road towards more competition and better coach passenger transportation services.

The Brazilian train system is under-developed and the amount of passengers carried in inter-state routes is negligible. Up to recently, inter-modal competition between coach and planes was very limited, but evidence seems to suggest an increase since the late 90's. Waterways play some role in some states but are very specific to those markets. Finally, "self transportation" can be seen as a substitute to passenger transportation services by road, as supported by Guimarães and Salgado (2003).

3. A Reduced-Form Pricing Model for Coach Transportation

Our main objective here is to make inference about coach operators′ pricing behaviour and above all to infer the significance of inter-modal competition in Brazil from available data, which can be performed by estimating the sensitivity of coach fares to air travel fares once cost components are controlled for. In other to accomplish that, here we follow the airline literature, for example, Borenstein (1989) and Evans and Kessides (1993), and develop a reduced-form model for pricing decisions of firms in the market. The pricing model employed is the following:

$$\begin{aligned} \Delta coach_{kt} = {} & \beta_1 \Delta diesel_{kt} + \beta_2 \Delta tire_{kt} + \\ & + \beta_3 \Delta toll_{kt} + \beta_4 \Delta petrol_{kt} + \\ & + \beta_5 \Delta airline_{kt} + \gamma_k + \gamma_t + \gamma_m + \varepsilon_{kt} \end{aligned} \qquad (1)$$

Where the mathematical operator Δ here means price change (*in percentage*) within one unit of time, that is, ΔX_t is approximately equal to $(\ln X_t - \ln X_{t-1})$.

$\mathbf{\Delta coach_{kt}}$ is the average change in intra-state coach fare in city k and time t; $\mathbf{\Delta diesel_{kt}}$, $\mathbf{\Delta tire_{kt}}$ and $\mathbf{\Delta toll_{kt}}$ are cost shifters, representing, respectively, the average change in the unit prices of diesel, tire, and motor oil in city k and time t; $\mathbf{\Delta petrol_{kt}}$ is the average change in the price of petrol in city k and time t; $\mathbf{\Delta airline_{kt}}$ is the average change in the price of air travel in city k and time t. $\boldsymbol{\gamma_k}$, $\boldsymbol{\gamma_t}$ and $\boldsymbol{\gamma_m}$ are, respectively, city-specific, time-specific and month-specific effects, designed to control for potential unobservables across cities and time, and also to account for seasonality across the year (γ_m).

The dataset used was collected from Instituto Basileiro de Geografia e Estatística (IBGE), which produces the National System of Consumer Price Indexes; more precisely, we used the same data on transportation prices change collected for the Extensive National Consumer Price Index - IPCA. It is basically a set of monthly series from August 1999 to April 2005, disaggregated for the following geographic areas in Brazil: metropolitan regions of Belém, Fortaleza, Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo, Curitiba and Porto Alegre, Brasília and municipal district of Goiânia. We had to drop Belém, Fortaleza and Recife, however, as we detected no series of inter-state travel price change in the original data, as obtained from one of IBGE´s websites[2]. Therefore, the final sample size had 476 observations (k = 7 regions and t = 68 months), in a balanced panel data.

One caveat about the data used here: as the most disaggregated unit of observation available from IBGE´s dataset was measured at the city-level, one has to be cautious when interpreting estimation results, as it is well recognized that the relevant market in transportation is actually the origin-and-destination pair. Therefore, our city fares analysis must be interpreted as the study of average behavior across origin-and-destination pairs. Besides that, we cannot observe average stage length for both coach and airline

Below is Table 1, with some descriptive statistics for the variables in (1); note that, for simplicity, indexes k and t are omitted from now on:

Table 1 – Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
$\Delta coach_{kt}$	0.923830	2.678064	-6.04	16.11
$\Delta diesel_{kt}$	1.536418	3.242790	-4.39	15.2
$\Delta tire_{kt}$	1.189462	1.644039	-2.81	7.79
$\Delta toll_{kt}$	1.188261	3.155881	0	17.9
$\Delta petrol_{kt}$	1.064161	4.021127	-13.65	14.83
$\Delta airline_{kt}$	1.316335	4.231087	-18.53	24.81

Note: variables expressed in nominal percentage.

The estimator used here is the feasible generalized least squares (FGLS), allowing for estimation in the presence of panel-specific AR(1) autocorrelation and cross-sectional correlation and heteroskedasticity across panels. Also, as (1) permits observing, there are both time (months) and section (cities) fixed effects.

Table 2 presents the estimation results:

[2] http://www.sidra.ibge.gov.br/

Table 2 – Estimation Results

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Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        heteroskedastic with cross-sectional correlation
Correlation:   panel-specific AR(1)

Estimated covariances      =        28          Number of obs      =       483
Estimated autocorrelations =         7          Number of groups   =         7
Estimated coefficients     =        79          Time periods       =        69
                                                Wald chi2(79)      = 518232.11
Log likelihood             = -505.1321          Prob > chi2        =    0.0000

------------------------------------------------------------------------------
     Δcoach_kt |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
---------------+--------------------------------------------------------------
    Δdiesel_kt |   .0963080   .0468780     2.05   0.040     .0044288    .1881872
      Δtire_kt |   .0400761   .0392132     1.02   0.307    -.0367804    .1169326
      Δtoll_kt |   .3223314   .0183595    17.56   0.000     .2863474    .3583153
    Δpetrol_kt |  -.0401422    .023142    -1.73   0.083    -.0854996    .0052152
   Δairline_kt |   .0406109   .0199123     2.04   0.041     .0015835    .0796384
         γfeb  |  -.1271111   .1805876    -0.70   0.482    -.4810563     .226834
         γmar  |  -.2236079   .1981258    -1.13   0.259    -.6119273    .1647115
         γapr  |  -.3242311   .1701323    -1.91   0.057    -.6576843    .0092221
         γmay  |   .0041366   .1231831     0.03   0.973    -.2372977     .245571
         γjun  |  -.3872105   .2564612    -1.51   0.131    -.8898653    .1154443
         γjul  |   3.942331   .2966829    13.29   0.000     3.360844    4.523819
         γaug  |   1.679964   .3539738     4.75   0.000     .9861877     2.37374
         γsep  |  -.1427403   .2062176    -0.69   0.489    -.5469193    .2614388
         γoct  |   -.634172   .2896711    -2.19   0.029    -1.201917    -.066427
         γnov  |  -1.356757   .7282589    -1.86   0.062    -2.784119    .0706039
         γdec  |   .5508586   .4791721     1.15   0.250    -.3883016    1.490019
------------------------------------------------------------------------------
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Note: Estimated time and city-specific effects (γ_k and γ_t) omitted

4. Discussion of Results

As we have earlier pointed out, coach transportation potentially suffers from inter-modal competition with self transportation and with air transportation. The reduced-form pricing model estimated and presented in Section 3 may offer some evidence on the degree of inter-modal competition that characterizes these markets.

We tested for the presence of inter-modal interaction (probably due to a substitution effect) among air and road transportation for the inter-state market, and found a small but significant effect. In fact, one cannot reject, at five percent of significance, the null that airline fare variations have no effect on coach fare variations. This result is achieved once relevant cost components are accounted for – that is, price variation of diesel, tire and toll. This is quite a relevant outcome because the coach travel industry is usually regarded as a major cartel in Brazil, that is, not subject to internal competitive pressure; thus, the results here indicate that there is significant competition stemming from inter-modal competition with airlines.

It is important to emphasize that the interaction between the air and road markets for passenger transportation may take place in their borders. **Premium coach passengers**, that is, those who are able to pay for the highest fares as they have higher sensitivity to coach quality, are the effective **marginal consumers** in this market; therefore they constitute the smaller set of passengers who consider changing means of transportation when price differences narrow down. So the airline industry has been from time to time appealing to the upper-class coach passengers, who go for flying during air fare wars or deep discount periods, and eventually go back to the coach service in ordinary periods. The estimated coefficient of $\Delta airline_{kt}$, in Table 2, may then suggest that cross-elasticities between air and ground transportation of passengers are no longer negligible in Brazil – a phenomenon that certainly deserve further investigation.

The main relevant variables for the choice between coach and car driving include infrastructure usage fees (road tolls and coach/airport terminal fee), fuel costs and car maintenance. We assumed that terminal costs are negligible. As for toll prices, any change will equally affect coach transportation and car driving because we worked with variations rather than levels. We also found that gasoline price has a negative (but not much significant) effect on coach prices, a counter-intuitive result. Tire prices may be used as a proxy for car maintenance expenses, but it affects both forms of transportation and thus price changes were not significant for explaining pricing behavior.

Conclusions

The objective of this paper was to identify and measure potential inter-modal competition in the interstate travel market in Brazil. By estimating a reduced-form model of pricing decisions of coach operators, it was possible to test whether the inter-modal interaction between air and road transportation was significant.

Results indicated that coach fares are sensitive to air fares, indicating significant interaction and potential substitution effect. This is quite a relevant outcome because the coach travel industry is usually regarded as a major cartel in Brazil and therefore not usually subject competitive pressure. The most probable explanation for that is related to the presence of premium coach passengers, with higher willingness-to-pay, who go for flying during air fare wars or deep discount periods, and eventually go back to the coach service in ordinary periods.

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