Should subsidies to urban passenger transport be withdrawn? A dynamic CGE analysis for the Brazilian economy

Topic: IO Modeling (2) Computable General Equilibrium Modeling and Social Accounting Matrices
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Brazilian urban transport services are traditionally subsidized and regulated with a price control mechanisms by public administration. The subsidies for urban transport contribute to set the prices to below the costs of delivering services and increase in its activity levels, benefiting different customer groups. Change in these urban transport subsidies tends to affect households differently, which present a typical position in the structure of expenditure and income. According to Carvalho and Pereira (2012), on average, Brazilian families spend 15% of their income on urban transportation, with private transportation expenses being five times higher than public transportation expenses. Poorer households spend relatively more by urban transport. Moreover, in Brazil there is an urban structure in which the families with the highest incomes live in the metropolitan suburbs, precisely where transportation costs the most. It is clear the need for subsidies to these users that present high costs due to greater distances (IPEA, 2013). Some examples are subsidized public transport fares, reduced indirect tax rates for public transport, gasoline tax exemptions or subsidizing automobile travel through parking fees. In Brazil, there is the subsidy given for the purchase of new automobiles, subsidies for the acquisition, licensing and use of taxis, subsidies for public transportation in bus purchases and in the operation of railways.

The Institute for Applied Economic Research (IPEA) estimates which the subsidies to automobiles amounted to between 1.5 and 7.0 billion real in 2004. Most are related to the acquisition of new vehicles. Cars also enjoy the subsidy for free parking on public roads. Assuming that about 6.75 million people park outside the house for free on public roads, with an average parking time of 4 hours and a private cost of 3 real, the result would be an annual cost of 7 billion real. Cars receive up to 90% of the subsidies given for the Brazilian passengers transport, which is 12 times more than public transport. Taxis receive subsidies from the government of exemption from tax for the purchase of new vehicles, exemption from licensing fees and free parking for 24 hours on public roads. However, the taxi system serves only the small portion of the population with greater purchasing power. Both policies encourage the use of the car, reducing its cost of travel relative to

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other means. According to IPEA, the government could reduce incentives to buy cars, motorcycles and taxis, which cause congestion, pollution, accidents and impacts on public health, favoring urban public transport. On the other hand, the public administration could create other specific sources of financing for public transport, such as the taxation of gasoline in Bogotá and the creation of urban tolls in London, with funds entirely devoted to the public transport financing.

Especially about the public transport, direct operating subsidies are not common in the bus system, which in most cases is funded exclusively by the revenue collected from passengers. This point is contrary to what happens in developed countries, where there is strong state funding, which recognizes the importance of a public transportation system. Unlike urban bus services – which obtain their remuneration exclusively from the collection of tariffs –, the metro rail transport system are subsidized to a large extent by the State. Public transport systems in the city and metropolitan area of São Paulo are exceptions to this model of exclusive financing through tariffs, with subsidies paid by the society as a whole, through the general budget of the municipality and the state, which cover about 20 % of the operating costs of the systems. Although it is an exception to the existing model of financing in the country, the subsidies in the case of São Paulo, for example, are well below the average levels of European subsidies (IPEA, 2013). The Annual Survey of Services (PAS), by the Brazilian Institute of Geography and Statistics (IBGE), shows that subsidies for metro rail transportation were 3.1 million real in 2015 (IBGE, 2015). With the absence of subsidies in Brazil, the increase in costs is passed on directly to fares, which increased by about 60% more than inflation in the last 15 years. These figures above show that transport is significantly subsidized in a variety of ways. According to Pereira et al. (2015), another aggravating factor for the most expensive tariffs is the increase in gratuities for students, children up to four years old, elderly people 65 and older, police officers and postmen, who are not covered by public funds, but cross subsidies. It means that the travel costs of these individuals are incorporated into the final value of the fare paid by other users of the public transportation system.

The main aim of this paper is analyze the effects of a scenario without urban transport subsidies on Brazilian economy and the structural changes on income and expenditure of the household groups. Our contribution is to bring innovations in terms of Computable General Equilibrium (CGE) models by incorporating the structure and flows of the Brazilian Social Accounting Matrix (SAM), as well as to enable a better understanding of the relationship between passenger transportation and income redistribution once that changes in distributive structure promote changes in household consumption. Moreover, with a limited number of empirical studies relating passenger transport and the structure of household income and expenditure, this particular

research paper tries to overcome the research gap and directions attention to pertinent transport policy questions.

For empirical analysis, we use a dynamic Computable General Equilibrium (CGE) model with core database is based on the 2010 Brazilian Social Accounting Matrix (SAM), detailing the income generation and appropriation by different sources and the spending structure, as well as the preferences of 10 representative households by 4 passenger transport services. Compared to input-output (IO) table, a SAM shows not only the interindustry structure of the economy but the linkage between economic structure and an income generation, distribution and use by institutional sectors (Households, Enterprises, Government). The information on consumption and household income were obtained through the Consumer Expenditure Survey (POF). Furthermore, the model contains 129 commodities, 67 productive sectors, 13 institutional sectors (10 Representative Households, Enterprises, Government and Rest of the world), 2 production factors (Capital and Labour), 2 margins (Trade and Transportation) and 3 accounts for taxes and subsidies. Both the specification of the behavioral equations and the implementation of the CGE model were performed with reference to the Australian tradition model PHILGEM (CORONG; HORRIDGE, 2012; CORONG, 2014), which extends the ORANI model (DIXON et al., 1982; HORRIDGE, 2006), with the mechanisms of recursive dynamics. The model brings innovations by incorporating SAM flows within its theoretical framework and the detailing of the transport markets in Brazil.

CGE models have been recently used in empirical work to assess issues of the transport economy. However, the passengers transport is little studied in its relations with the distributive and economic effects within the CGE model. The seminal research as Verikios and Zhang (2012), for example, aims to construct a multi-region CGE model to analyze structural changes in the Australian ports and the rail freight industries during the 1990s. In another work, Verikios and Zhang (2015) also calibrates a multi-region CGE model to evaluate the effects on household income groups of structural change that Australian urban transport industries experienced substantial reform during the 1990s. Kalinowska and Steininger (2009) analyzed the repercussions of a road charging on the family income of four households, through a CGE model for Austria and Germany. Tscharaktschiew and Hirte (2012) have used an urban spatial CGE model, calibrated for a German economy, to examine efficiency, environmental effects (CO2 emissions) and spatial effects of increased different kinds of passenger transport subsidies discriminating between household types. Beyond these works, it is possible to find other important contributions at the literature (i.e. BERG, 2007; HADDAD et al., 2015; LENNOX; ADAMS, 2016).

With the policy of withdrawal of subsidies and tax exemptions, transport tariffs may have readjustments and become more expensive, harming the poorest households. Tariff readjustments in

public transport, for example, can cause a displacement in the budget constraint of the poorest families by the income effect and the reduction of other items of consumption by substitution effect (GOMIDE, 2003). The main results of the simulations indicate that subsidizing public transport is welfare enhancing. Public subsidy for public transport services is an important measure to facilitate the population access to these services.

In general, the withdrawal of subsidies to metro rail transport system led to a fall in the real income of families, especially among the poorest, since transportation tariffs are more expensive. These tariffs are adjusted to more closely reflect the costs of providing services to different customer groups. The richest families obtained the lowest reduction of income in the long term (0.0602%), since they are the classes that least uses the rail transport system. As expected, the impacts on the real consumption of households have the same direction and magnitude of the effects on the income, since the specification of the consumption implies that its variation follows the changes in disposable income. Household savings are decreasing. With of withdrawal of subsidies to metro rail transport system, there is a substitution by the bus for the paying users, since the CGE model captures the substitution between subway and bus. If the transportation fare becomes more expensive, families may choose to use private transport as well, since it has government subsidies and may be cheaper than using public transport.

Finally, the results corroborate with the analysis of Tscharaktschiew and Hirte (2012), that is, the only policy that provides significant improvements in (urban) welfare is subsidization of urban public transport.

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