International Transport Forum

Balancing Financial Sustainability and Affordability in Public Transport

The Case of Bogotá, Colombia

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Abstract

In order to meet the challenges of providing affordable public transit services for the urban poor and at a cost that doesn't impinge on the system's financial sustainability, cities can consider setting fares at "cost recovery" levels for the majority of the population and targeting subsidies to those who need them most. Bogotá is a case in point—the new public transport system was designed so fares are set close to "cost recovery" levels to aim for greater financial sustainability. To provide affordable services, the city leveraged the adoption of smartcards in its new public transit system and the country's poverty targeting instruments to implement a pro-poor public transit subsidy. This paper presents a critical analysis of Bogotá's experience with trying to balance financial sustainability and affordability. The paper describes some of the features of Bogota's tariff policy, namely, the concept of tariff set at "cost recovery" levels and lessons learnt in trying to achieve financial sustainability. The paper also lays out the rationale, design and implementation of Bogota's pro-poor public transit subsidy, and the subsidy's impact on its beneficiaries.

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Introduction

Public transport is an important mode of transport, especially for low-income populations. Cities, however, struggle to provide public transport services for fares that are both affordable and financially sustainable. Since meeting both goals is quite difficult, transport systems, either end up relying on high levels of subsidies or charging transit fares that are too expensive for the city's poor.

As a result, some city's transport systems use low fare levels (examples are Buenos Aires or the Mexico City subway), which require high amounts of public subsidy. Other cities use higher and thus more sustainable fares, but risk excluding the poor from public transport. The latter is the case in Bogotá, Colombia, where fares for its new public transit system are set high, close to cost-recovery levels, which may be unaffordable for part of the population. Bogotá is currently implementing its Integrated Public Transport System (*Sistema Integrado de Transporte Publico, SITP*), which will integrate under a single fare, operation, and infrastructure all its Transmilenio's Bus Rapid Transit (BRT) corridors with the traditional bus system, the bike network and, in the future, Bogotá's first subway line. One of the prominent features of this public transit reform process—both in Transmilenio and the SITP— has been the profound change in the business model and incentive structure for public transport service provision. These new incentives are embedded in the concession contracts for service provision, and are linked to the underlying concept of a tariff policy set at "cost recovery". Against this backdrop, Bogotá has tried to balance the needs for financial and social sustainability by setting fares at cost-recovery but then offering targeted subsidies for specific segments of the population.

This paper presents a critical analysis of Bogotá's experience with trying to balance financial sustainability, by setting fares close to cost recovery levels, with affordability, by implementing targeted demand side subsidies for public transit. The paper describes some of the features of Bogota's tariff policy in the context of the ongoing reforms; namely, the concept of tariff policy set at "cost recovery" levels, and explains how a structured process that incorporates incentives for efficiency via concession arrangements for service provision was developed. Against this backdrop, the paper also explains how the city tackled some of the affordability constraints of the poor, by developing a targeted public transit subsidy that leveraged the country's poverty targeting system and database, and the progressive adoption of smartcards in its public transit system to design a pro-poor targeted subsidy scheme.

The first section of this paper provides a literature review on the case for supply and demand side subsidies in public transit, particularly for a developing country context. The second section describes how Bogotá developed a structured process to set fares set close to "cost recovery" in its new transport system, and some of the lessons learnt in aiming for greater financial sustainability. The following sections describe the design, implementation and impact of Bogota's pro-poor subsidy scheme. This section also briefly explores the results of the impact evaluation that analyzed the determinants of opting to request the subsidy and the subsidy's impact on user's labor market outcomes. The paper concludes with some recommendations in terms tariff policy, financial sustainability and design of targeted pro-poor subsidies.

Subsidies in public transit - the case for supply and demand side subsidies

A critical policy question is whether public transit subsidies should be given on the supply or on the demand side. There are three primary theoretical justifications for supplyside public transit subsidies. First, it is argued that such subsidies reduce the cost of environmental externalities; second, that they exploit users economies of scale; and third, that they increase cost efficiency of public transit systems as a whole. The first argument is based on the idea that subsidies can reduce congestion by shifting use from individual automobiles to public transport (here, subsidies act as a second-best alternative to marginal social cost pricing of road use). However, this hinges on the attractiveness of public transport to current automobile users, and the cross-elasticity of demand has been found to be typically low (Toner 1993, Wardman 1997, Paulley et al 2004, Litman 2015). The second argument, based on the so-called Mohring effect (Mohring, 1972) which describes the observation that there are increasing returns to scale for urban transit services because the frequency of a service increases with demand, and so increases in demand reduce the time costs associated with waiting and transfers. This, however, relies on excess supply side capacity. Finally, the cost-efficiency argument posits that public transit subsidies can reduce total transport system costs through greater economies of scale due to transport system intermodality (Train 1977).

Empirically, under certain conditions supply-side subsidies that help improve the quality of service by increasing service frequency have been found to be socially desirable (Dodgson 1987; Glaister 1987, 2001; Savage and Schupp 1997; Small and Gómez-Ibáñez 1999; Savage 2008; Parry and Small 2009). However, some disagree that providing supply side subsidies are favorable because of the negligible effects on the quality of service and the associated adverse effects on operational efficiency. Studies of subsidy impacts (Altshuler et al, 1981; Meyer and Gomez Ibanez, 1981; Hilton, 1974l Hamer, 1976; Webber 1976) have concluded that direct benefits to transit rides have been small relative to the increase in the subsides and that alleged environmental and secondary economic benefits are negligible or no existent. Goldman and Wachs (2003) have shown that, in the United States, transit subsidies have resulted in system inefficiencies because of inadequate allocation mechanisms and incentives for cost-efficiency, and failure to improve level of service via increased frequencies or fare reduction. Pucher, Markstedt and Hirschman (1983), found that US Federal subsidies and dedicated state and local subsidies had a slight cost-inflationary effect on the cost of providing transport services, further exacerbating increases in cost. In the US during periods when subsidies have increased most, productivity has declined, causing costs to grow more rapidly. Obeng (2009) finds that transport subsidies are inadequately used, and points to the inefficiencies and risks associated with the perverse incentives created by supply-side subsidies. A report by TRRL (1980) estimated that up to half of the costs of subsidies in the UK in the eighties were estimated to "leak" to operators in the form of high wages or inefficient operating arrangements.

In developing country contexts, the arguments against supply-side subsidies can further be extended by the need to limit the fiscal burden, given limited resources and competing needs; and the need to focus subsidies where they are most needed socially (Gwilliam 2012, Serebrisky, Gomez-Lobo, Estupinan and Munoz-Raskin, 2009). Hence, to balance the needs for economic and social sustainability, ideally cities should try to set fares close to cost-recovery, but offer targeted demand-side subsidies for specific segments of the population that face an affordability constraint. This, however, introduces additional complications, and the experience thus far with demand-side subsidies is mixed; these subsidies have not always led to the intended results because of difficulties with accurately identifying the target population, potential abuse of the subsidy such as transferring the subsidy to an unintended recipient, and large errors of exclusion or inclusion of the target population (Box 1). There is also very little evidence on the impact that such subsidies have on the lives of target beneficiaries.

Box 1. Lessons from "first generation" demand-side subsidy programs

Several types of subsidies have been used to support low-income users of public transport. While well-intended, the subsidies provided through these "first generation" subsidy programs do not always reach the target audience and may even have unintended outcomes. The following are four types of subsidy programs and lessons that have been learned from their implementation:

- **Vale-Transporte.** This subsidy program in Brazil caps commuting expenses for workers in the formal economy to 6% of their wages, with employers paying for the rest as a tax-deductible expense. Employees could request to join the program. This makes formal workers somewhat immune to higher transit tariffs, while providing no relief to workers in the informal sector (who constitute about 57% of the labor force nationwide). The government paid about 35% of the cost in foregone tax revenue. This subsidy created a substatintial black market for reselling 'free' tickets.

- **Cable cars (telefericos) and feeder lines.** Teleferico services in Rio de Janeiro (Brazil) and Medellin (Colombia) provide free transport to and from certain poorer neighborhoods using cable cars. In Bogotá (Colombia), free "feeder lines" connect certain neighborhoods to the city's Transmilenio BRT system. While providing free services to poorer neighborhoods increases access, this kind of subsidy has significant exclusion errors in that it excludes a large number of low-income households living elsewhere in the city. The subsidy may also exacerbate a city's already existing spatial segregation.

- **The Bilete Unico and Integrated Fares that subsidize transfers.** The Bilete Unico system in Brazil, and integrated fare systems in Bogotá and Santiago, use a card to cap the fare for multi-modal trips. The program subsidizes transfers, which (in an urban structure with most of the poor living in the city's periphery and often needing to transfer) overwhelmingly supports low-income households. It however also reinforces tendencies for urban sprawl and is characterized by errors of inclusion.

- **Subsidized fares for the elderly, students, war veterans, and other categories.** While an important way to improve transport access for target groups, this kind of subsidy suffers from both inclusion and exclusion errors: many poor might not fall into one of these categories and people who do may not be poor.

Source: Mehndiratta et al(2014)

Building on the experiences of these "first generation" subsidies, Bogota has recently innovated in targeted demand-side subsidies for the poor. The following sections explain how Bogotá implemented a structured process to set fares at "cost recovery" levels and how it dealt with an affordability constraint for the poor by designing and implementing targeted demand-side subsidies.

The basics of Bogota's tariff policy & the concept of cost recovery

Until the development of the Transmilenio system in 2000, all public transportation in Bogotá was operated under a system characterized by an inadequate incentive structure that led to an oversupply of buses, increased congestion, reduced vehicle safety and lowquality service. Bus companies owned the

routes granted to them by the city government but were not required to own the bus fleet. Individual investors owned buses, and bus companies rented out to bus owners the right to operate a certain route. This arrangement induced bus owners to compete against other buses, irrespective of demand patterns, as their revenue and the wage of the bus driver was directly related to the number of passengers carried. Bus companies' main assets were their routes as they rent them out to bus owners, so they had the incentive to lure as many buses as possible to operate their routes. The incorporation of a number of buses beyond those required to serve the market led to excessive competition, locally known as "the penny war" (guerra del centavo) because drivers literally fought for each prospective passenger (World Bank 2012).

In response to these shortcomings, by the end of the 1990s, the government of Bogotá began to explore alternative ownership models and incentive structures that maintained the benefits of privatization but improved service provision. One such ownership model was concession contracts for service provision. In this system, a competitive bidding process is used to determine which bus operators will have the right to operate a route or a number of buses. The concession is for a limited period of time, which ideally coincides with the useful lifespan of the fleet, as opposed to the lifetime permits offered in the traditional model. Bus operators, in turn, need to own the bus fleet and operate it under close supervision and regulation from the public sector, which determines whether operators supply the scheduled service. On the infrastructure side, the system uses exclusive bus ways, high-capacity buses, a centralized fare collection system based on the use of smartcards and a fleet control system (World Bank 2011). This new ownership model, incentive structure and infrastructure provision was at the crux of the Transmilenio BRT system, implemented in Bogotá in December 2000.

There are several features of the basic tariff model developed in the context of Transmilenio and used subsequently in Bogotá's SITP and in all of the other Colombian BRT systems that are worth highlighting. The systems were designed to be operationally self-sufficient with fares set at "cost recovery" levels. At present, Colombian law (Law 86 of 1989, Article 14) requires that public transport systems operate in this manner and that city government does not subsidize the system. In fact, the law mandates that fares charged should be sufficient to cover the costs of operation, management, maintenance and replacement of the bus fleet. In order to determine the appropriate cost-recovery fare a structured process was developed that incorporated incentives for efficiency. The process is as follows, first, the public sector administrator designs the system and the operating plan. The public sector is also responsible for developing and maintaining the system infrastructure. The cost elements included are those associated with bus operations, fare collection and management, a trust agent (in charge of collecting revenue and then distributing payments to all agents) and a public sector system administrator in charge of planning and managing the system. Each of these elements (except the public sector administrator costs, which are estimated and added to the other costs) is then bid out separately. In the case of bus operations, there is a strong focus on keeping in the new system as far as possible, drivers and operators who were participating in the old traditional system. As such, owners and drivers are encouraged to organize into formal companies that then bid against each other (often with partners that could include operators from outside the city) for a share of the service. Lastly, a notional "technical tariff" is then estimated by summing up the winning-low bids for each cost element (plus the per ticket costs estimated for the administrator) and dividing that by the expected ridership. In other words, the "technical tariff" or the tariff that allows for cost recovery is an indicative tariff that captures the required average revenue per ticket sold that is needed to guarantee that the remuneration of all of the system's service providers (bus operators, fare collectors, trust agent, planning agency) is covered, given a predetermined level of service.

Four features of this structure and the experience with this system in Bogotá are worth highlighting.

- First, in general, the creation of the notional "technical tariff" needed to operate the system at cost-recovery levels, constructed in a manner that incorporates incentives for efficiency for different stakeholders has been a useful and important development. While the user tariff

needs to closely track the technical tariff, the city Mayor (who determines the user tariff) has some discretion on timing and level of adjustments. The result has been a system whereby (i) the need and level of user tariff adjustment needed has been important public information making at least somewhat easier the Mayor's task of adjusting fares; (ii) in Bogotá the system has gone through periods when the user tariff has been higher than the technical tariff – creating a surplus that has helped finance deficits in periods (like the present) where adjustments in the user tariff have lagged changes in the technical tariff.

- Second, the ridership estimates play a critical role in determining the initial technical tariff. In the case of the initial Transmilenio corridors, demand exceeded estimates, thus providing the system with surpluses in initial stages. In the case of the SITP actual ridership levels have been significantly lower than expected, leading to important deficits for the systems in initial stages. The experience clearly reinforces the need for high quality demand forecasts as an input into project structure.

- Third, it is the bidding process that guarantees efficiency in costs, and as such, the level of efficiency obtained depends on the competitiveness of the bidding process. Bus-operating costs constitute the bulk of the technical tariff (between 70-80%), and as described above the initial bidding process, while competitive is not truly open. To safeguard the interest and livelihood of the traditional and largely informal public transport sector, the tendering process includes prerequisites that protect sector incumbents. On one hand, given the complex social environment characterizing the traditional bus system in Bogotá, the ability to create some competitive dynamic is itself both difficult and commendable: in a similar environment in Mexico, the practice is to negotiate with no elements of a competitive dynamic. Compared to that, the practice in Bogotá provides an important incentive for efficiency in bus operating costs. However, a truly "competitive" and open tendering process is ultimately the best guarantor of efficiency. This suggests the need to ensure that initial contracts are of a reasonable duration and that once they expire they are followed by open competitive bidding processes. In reality, the initial contracts for Bogota had duration of 12 to 14 years, but were extended by Transmilenio in a recent renegotiation. The SITP contracts have duration of 24 years. In the medium and long term, moving towards a system of re-competing concessions openly would be important to ensure system efficiency.

- A fourth element of the tariff system is "scope creep": more and more cost elements not directly related to operations have been loaded on the tariffs. In Bogotá the tariff is also paying for planning and supervision of the systems (by way of financing the BRT agencies, Transmilenio), bus scrapping costs (indirectly as part of bus operating costs) or infrastructure provision. Many of these costs are capital costs— bus scrapping, fleet renewal, infrastructure— and/or elements of the reform process –formal employment for bus drivers and maintenance personnel— that bring benefits not just to users but to society as a whole— pollution and GHG emission reduction, road safety. Thus, it is not clear that public transit users should have to pay for enhanced societal welfare or for non-operating costs. All in all, the fact is that for lack of more sustainable and secure sources of funding, the tariff has been used sometimes arbitrarily to finance a number of elements that are not direct "operating costs" and are placing strains on the financial equilibrium of the system.

Bogota's pro-poor subsidy scheme

In order to meet the challenge of improving affordability to public transit for the poorest, Bogotá rolled-out in early 2014 a "pro-poor" public transit subsidy based on recent technical assistance provided by the World Bank (World Bank 2013). This work provided a better understanding of the poor´s travel patterns, the alternatives for targeting the subsidy, the implications on the system´s costs, and alternatives on how to implement the scheme. The following sub-section presents a framework for how Bogotá designed this scheme which is based of four key considerations: (i) understanding the current and expected travel patterns of potential beneficiaries; (ii) understanding who to subsidize and by how much; (iii)comparing system impacts and financial implications; and (iv) planning for implementation[1].

A framework for designing and implementing a targeted transport subsidy

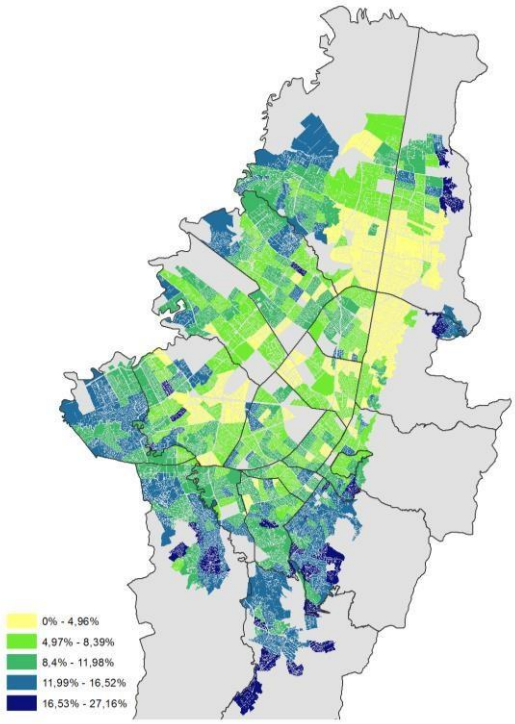
Understanding current and expected travel patterns. An important part of a successfully designed subsidy program is understanding how mobility constraints and poverty are interacting and how people, in particular the target population, currently travel and will likely travel under a subsidized scheme. Answering these basic questions, however, is not easy, as a significant mismatch exists between available data on travel patterns and data on poverty. While many cities collect travel survey data as part of their broader transport planning process, most of these surveys do not include good information on poverty— specifically poverty as measured by multidimensional factors. Likewise, poverty surveys rarely collect mobility data.

For Bogotá, data was analysed from the 2011 Mobility Survey, the Multi-Purpose Survey, as well as further analysis were performed to spatially correlate quality of life indicators with mobility patterns. According to Bogotá's 2014 Multi-Purpose Survey, which provides welfare and socioeconomic indicators for the city, households in the poorest areas of the city spend a greater percentage of their income on transport, between 16% to 27%, compared to a maximum of 4% in areas that are relatively richer (see Figure 1 and 2). Bogotá's 2011 Mobility Survey also corroborates this—the population in the lowest income strata usually travels less, and walks or bikes for longer trips.

Figure 1. **Number of trips and individual income intended for the transport**

Source: Bogotá Multi-Purpose Survey, 2014.

Figure 2. **Public transportation spending as a Proportion of total household expenditure**



Source: Bogotá Multi-Purpose Survey, 2014.

Understanding who to subsidize and by how much. Different kinds of subsidy schemes exist (including also the "first generation" schemes from Box 1) and which one fits best depends on the characteristics of the city population, the transport system, and transit users, as well as on political decisions related to the available resources and size of the target populations. A systematic comparison of alternative subsidy schemes, including (i) traditional socio-demographic subsidies (i.e., targeting specific groups such as the elderly or students); (ii) employer-based subsidies (which generally exclude the informal sector); (iii) spatial subsidies (e.g., subsidies for trips that begin or end within certain pre-determined stations); and (iv) schemes that target the poor directly (proxy-means tested), can provide a sound basis for discussion and decision-making. Ideally, this assessment will cover both affordability benefits to the target population and financial objectives for the transport system.

For the case of Bogotá, two targeting alternatives were analysed—proxy means tested by using Colombia's national targeting system, SISBEN ((Sistema Nacional de Selección de Beneficiarios, Refer to Box 2), or geographic targeting. In general, the goal was to minimize the subsidy's errors of inclusion (percentage beneficiaries that are unintended) and exclusion (percentage of intended beneficiaries left out) to ensure the subsidy reached the intended audience. In Bogotá, several technical and political reasons led to using the SISBEN as the targeting instrument. First, this instrument is used in all of Colombia's social safety net programs, and thus provided a transparent and well-known means to administer this new subsidy scheme; second, although Bogotá is spatially quite fragmented, and a geographic subsidy could potentially be implemented, the administration felt it could lead to further spatial segregation and fragmentation.

Determining how much to subsidize—that is, the impact of changes in fare prices on ridership, is complicated, as almost no empirical data exists on the response of the target population to significant changes in fare levels, in particular reductions in fares. Moreover, most empirical estimates of fare elasticity are valid only for small changes in fare levels. In the case of Bogotá, information on the fare

elasticity for different beneficiary groups (those currently using the integrated new SITP system; those using the traditional public transit system; and those currently not able to afford public transport) was needed to discuss alternatives of how much to subsidize and to assess the impact of the subsidy scheme on system revenues, costs, and operating conditions (see Box 3). Because only limited data was available about the way potential beneficiaries would react to changes in fares (either by increasing or decreasing certain trips or changing modes of transport), simple correlations were estimated using the city's mobility survey to get a sense of the direction and magnitude of their response to fare price changes, which was then followed by a price elasticity analysis using seven years of data from smart card swipes and user entries at different Transmilenio stations in one of Bogotá's poorest neighbourhoods, Usme. This time series included 2012, when Transmilenio applied a differential fare scheme that provided rebates for off-peak travel. Overall, the result of these different methodological approaches pointed to the fact that price elasticity for potentially poor beneficiaries was rather low (World Bank 2013).

Box 2. Proxy means testing for targeting – Using Colombia's SISBEN Instrument

Colombia has used two methods for targeting social spending: the geographically based Socio-economic Stratification and the proxy means tested System for Selecting Beneficiaries of Social Spending (SISBEN, in Spanish). The stratification instrument classifies neighborhoods and rural areas in strata based on the external characteristics of houses and neighborhoods. It is used to target subsidies for potable water, electricity and a variety of other small subsidies, by central and local governments. In order to more efficiency target other subsidies including health insurance, scholarships, conditional cash transfers, Colombia's National Planning Department (DNP) introduced the SISBEN in 1994. The general objective of SISBEN was to establish a technical, objective, equitable and uniform mechanism for selecting beneficiaries of social programs to be used by all government levels.

The SISBEN utilizes a proxy-means test in order to determine whether an individual is eligible for assistance based on whether he possesses the means to do without that help. The methodology relies on several socio-economic indicators—or proxies— (household demographic composition and marital status, education, employment, income, possession of goods and assets, and dwelling characteristics) to estimate household welfare. (World Bank 2005)

The SISBEN database is created in a two-step process. Initially, a statistical model is used to determine the variables that are representative of welfare level. These are then used to create the SISBEN questionnaires. In order construct the SISBEN database, municipalities identify poor areas to be surveyed using a variety of information to produce local poverty maps. Municipalities then launch the survey operation to apply SISBEN questionnaires to all residents in selected areas. People who are not surveyed because they do not live in the pre-selected survey areas can apply for SISBEN application at the municipal offices. The SISBEN Index gives a continuous score from 0 to 100 (from poorest to richest) divided into six brackets or levels (1 to 6). Levels 1 and 2 are people in poverty and able to receive most national and local programs.

The SISBEN methodology is updated every three years. The newest methodology for the SISBEN III, updated in 2015, applies a multidimensional concept of poverty and includes elements of the vulnerability conditions of the population. Most importantly however, the new SISBEN captures a larger degree of detail and representation in the ranges of scores used to deliver social programs. Whereas before, the methodology provided generalized levels for all social programs, the SISBEN III allows each program to define its own cutting points based on the objectives of the program, and the characteristics of the population. This allows each program to create a threshold score that best responds to the concept of poverty, deprivation, or vulnerability, of each program; in order to include the greatest amount of the population that requires the program and prevent the entry of people that do not need it. (DNP 2015)

Based on a 2009 World Bank report, proxy-means tested has proven to work particularly well in countries with high levels of informality and where personal and household income is difficult to verify. Proxy-means tested instruments are not unique to Colombia; they have been used in Countries such as Chile, Congo, Costa Rica, Cambodia, Indonesia, Mexico and Zambia.

Financial impacts-- comparing system impacts and financial implications. Assessing the financial sustainability of different subsidy schemes was a critical part of the planning and design process. The main objective was to determine the implications of the new subsidy scheme on overall ridership, system revenues, operating costs, and other conditions of the public transport system. In Bogotá, for instance the total revenue impact was a combination of the additional revenue obtained from new trips taken by beneficiaries, the foregone revenue resulting from subsidizing beneficiaries that are currently using the system, and any additional costs incurred by operators from increasing service supply to cater to new trips (Box 3). Elasticity estimates were also used in this part of the exercise to quantify these effects.

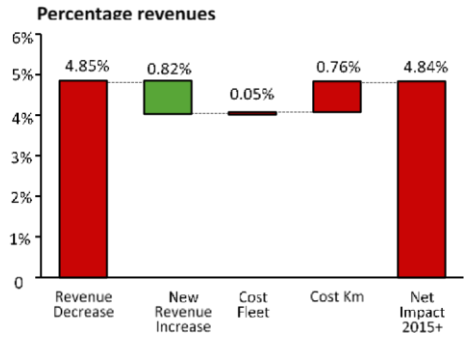
Finally, in terms of financial impacts and system comparison, attention was paid to funding sources of a subsidy scheme, which ideally would not come from the public transport revenue, to not put further financial strains on the system. Although for the case of Bogotá general city budget was used to launch the scheme, discussion on alternative sources of financing, such as generating cross-subsidies from private vehicle users (parking charges, congestion pricing, and fines) to public transit users, is critical. Using those funds to improve public transit systems, and financing targeted subsidy schemes, is ideally the more sustainable and economically sound financing scheme for these sorts of policies.

Box 3. Assessing the effect of a targeted demand subsidy in Bogotá's SITP

In Bogotá, the design of a targeted subsidy scheme required carrying out an assessment of the scheme's potential impact on Transmilenio and SITP system conditions (operating revenues, costs, and operational constraints) under the current contractual arrangements.

As shown in Figure 3, the analysis suggested three linked outcomes of the implementation of the planned subsidy scheme. First, partial revenue would be foregone for about 650 000 trips (about 4.9 percent of ridership) currently made by the intended beneficiaries annually who paid full fare. Second, additional revenue would be generated by 110 000 new trips a year, as a result of subsidy beneficiaries making more trips, adding 0.8% to ridership and revenue annually. Third, these additional revenues from new trips would require additional system capacity, leading to new costs— additional cost/fleet and cost/km logged—roughly equivalent (and thus canceling out) the additional revenue. These effects are a direct result of the fare elasticity of different beneficiary cohorts.

Figure 3. **Evaluating financial and operational impacts: Impact of a 30% face discount for the poor in Bogotá.**



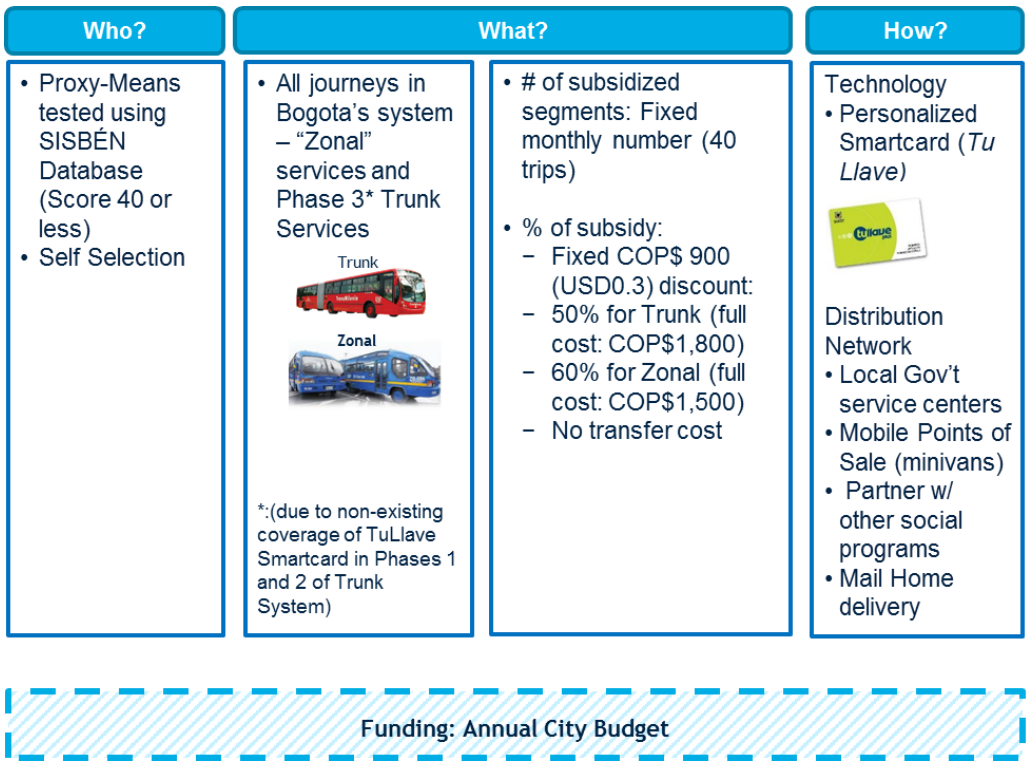
Source: Shomik et al (2014)

Planning for implementation. Several implementation arrangements and rollout strategies were analysed for Bogotá-- self-selection, dissemination and registration, subsidy delivery arrangements, sharing of databases between government entities, etc. Furthermore, since one specific element of the Bogotá subsidy scheme was to leverage the progressive adoption of the smartcard (TuLlave Card),

mechanisms to control subsidy abuse were analysed and adopted via the modification of the smartcard card protocols (inclusion of time windows, restriction on number of station validations, number of trips, etc.).

Figure 4 summarises the final design and implementation arrangements adopted. Citizens that live in Bogotá, that do not receive other concessional fares and have a SISBEN score of 40 or less can opt to request a public transit subsidy. The subsidy amounts to COP$900, equivalent to almost USD 0.30 (the average fare is USD 0.55), and is capped at 40 trips per month (on average this represents a 45% discount for trunk services, and 53% discount for feeder services). The card is also programmed with one free "credited" trip that can be used when the card is loaded, and once validated in a station, cannot be reused within a 30-minute window. Thus, people who are eligible have to request the subsidy, and the card is programmed with certain features to prevent subsidy abuse... Although the SISBEN dataset has the address of the potential beneficiary and in theory cards could be mailed to the entire potential beneficiary universe, Bogota decided to opt for the mechanism of self- selection during initial subsidy roll-out to manage potential subsidy abuse, get a better sense of the resources needed and mitigate fiscal impacts, as every card that is issued needs to be paid to the fare collection concessionaire. Potential beneficiaries can obtain the personalized subsidy card in the local government's city centres, Transmilenio Terminal depots, or using the mobile (minivans) points of sales. Once a potential beneficiary ID is validated against the SISBEN database, the beneficiary receives the smartcard in about three business days.

Figure 4. **Design and implementation of the Bogotá SISBEN Subsidy**



Source: World Bank

As of July 2015, almost 300 000 (updating info w Tranmsmilenio) people had obtained the smartcard with the subsidy, and almost 200 000 (updating info w Tranmsmilenio) had actually used it. However, subsidized smart card use has been substantially lower than the potential beneficiary population (nearly 800 000 people).

Impact of targeted pro-poor public transit subsidies in Bogotá

As explored previously, there is very little evidence on the impact of targeted pro-poor subsidies on the lives of its beneficiaries. As a part of a larger impact evaluation published in this year's Transportation Research Record, we explored the determinants of opting to request the smartcard with the subsidy, the effects of the subsidy in the use of the system, and the subsidy's impact on user's labour market outcomes.

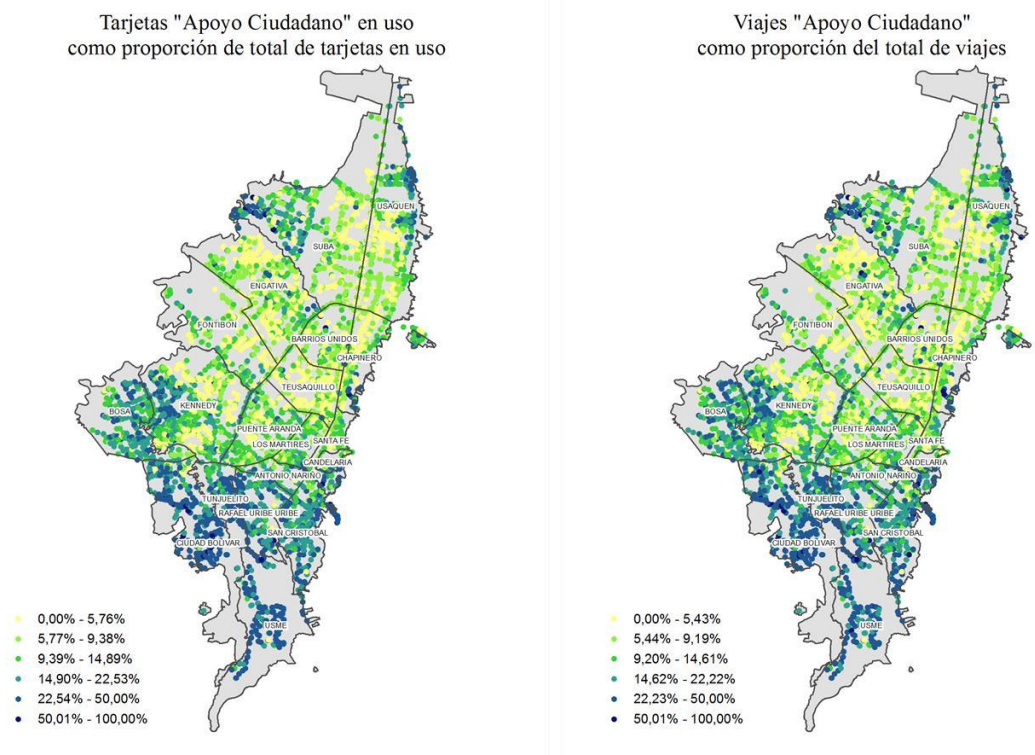
This impact evaluation explored the following questions: What are the determinants of user's "self-selection"? How did the use of the public transit system changed with the application of the subsidy? What are the causal links between the subsidy and labour market outcomes: employment and income? Two regressions, (linear and probabilistic) were used to identify the characteristics of individuals who choose to request the subsidized fare. A quasi-experimental technique was used for the impact assessment of the subsidy on the use of the system and on labour market outcomes. This research allows us to being to understand how to design targeted subsidies for maximum labour market outcomes

Determinants of user's "self-selection". In terms of the determinants of "self-selection", the analysis pointed to three important elements that affected the probability of obtaining the subsidized cards: word of mouth, employment status and gender. People who had a large number of neighbours in the program were more likely to enrol. Therefore a dissemination campaign that focused at the neighbourhood level (significant resources have been used by the administration to do mass media campaigns), and expands the opportunities for individuals to obtain smartcard for the first time (scaling up for instance the minivan strategy in very poor neighbourhoods, with low accessibility) are likely to increase the percentage of the target population that enrols. Furthermore, people who are working are more likely to apply for the subsidy, this may reflect that those that are unemployed have other binding labour market conditions (eg. lack of proper skills), or that the subsidy is not sufficient (higher percentage of the fare needs to be subsidized) to deal with their mobility constraint. Women seem to be more resourceful The fact that women are more likely to opt for the subsidy also might corroborate the argument that women have different travel patterns, and generally travel more due to other household and non-employment duties, and thus would benefit more from subsidized travel.

Effect of the subsidy on the use of the transit system. The smartcard database provides a clear understanding of how travel patterns of the beneficiaries had changed with the implementation of the SISBEN subsidy.

The results demonstrated that the subsidy beneficiaries had an increase use of the public transit system. The SISBEN subsidy recipients have an increase in monthly trips of nearly 56% when compared to normal fare card use. This translates into 10 extra monthly uses of the system -- on average users had eight additional trips and two additional transfers. These findings show that the subsidy helps overcome the lower frequency of daily-motorized travel among the poor previously explored (Figure 5). Secondly, the increase in transfers is also interesting, because the subsidy does not affect its cost. The subsidy did not decrease the cost of a transfer, and therefore the increase in transfers might indicate that the users are learning how to take advantage of a multimodal system.

Figure 5. **Subsidized cards in use and subsidized trips as a proportion of total**



Source: SISBEN

Furthermore, we found no significant effects on the total transport expenses incurred by users being subsidize. The proportion of income spent on transport did not change significantly, despite the subsidy. Users appear to be using the system more.

Labour outcomes. In terms of the effects of the subsidy on labour market outcomes, the results demonstrate that the subsidy had a significant increase on the hourly earnings of informal workers. The increase in income is not associated with an increase in the number of hours worked per week; in other words, the effect is not, related to timesaving that allowed the individual to work for longer hours. Rather, it points to the complementarity between mobility and productivity of informal activities—the subsidy appears to be increasing productivity by allowing informal workers to have better mobility and accessibility to economic opportunities, and thus higher earnings. Several exercises were performed to verify and further understand these results; these exercises corroborated the effect of the subsidy on informal workers' hourly income. Heterogeneous effects show that the effect on income of informal workers is particularly high for those who, despite being informal, have a hierarchical working relationship with an employee. This may be an indication that the channel through which the subsidy has an effect is through the increased ease of time management.

Conclusions

In order to meet the challenges of providing affordable public transit services for the urban poor and at a cost that doesn't impinge on the system's financial sustainability, cities can consider setting fares at cost recovery levels for the majority of the population and targeting subsidies to those who need them most. To this end, Bogotá, where fares are set at close to cost recovery, has designed and implemented a pro-poor public transit subsidy scheme that leverages the country's experience with poverty targeting instruments and the gradual adoption of smartcards in its new public transit system. This paper presented a critical analysis of the structured process adopted in Bogota to achieve a level of fares that is close to "cost recovery", and the rationale, design, implementation and impact of Bogota's pro-poor public transit subsidy.

In terms of tariff policy, the experience in Bogotá suggests that tariffs set at "cost recovery" should be stripped down to the operating essentials, so as not to have the users pay for capital cost or societal benefits. Furthermore, it becomes increasingly important, particularly after the initial stages of the reform, that each element or service competent included in the tariff is openly tendered to ensure efficiency. Tariffs set at "cost recovery" levels are critical in many parts of the world, either for reasons of law or because money from the public coffers is not available. Hence, to deal with political pressures, it is recommended that (i) there is some assurance of cost efficiency; (ii) there are schemes in place, such as targeted subsidies, to deal with the poor; and (iii) high quality demand forecasts are done, to aim for realistic system equilibrium. Furthermore, as there are steep learning curves in the initial years of the reforms, it becomes critical that contractual terms are not unreasonably long, so that subsequent phases can incorporate the lessons learnt.

In terms of targeted demand subsidies in public transit, the case of Bogotá allows us to begin to understand how to design targeted subsidies so that the poor and most vulnerable are able to seize the economic, educational, health, and cultural opportunities that greater mobility provides. However, further research on this topic, including analysing the impacts on mobility patterns and quality of life of the target population is needed. A randomized impact evaluation is being considered in Bogotá to assess the impact of different subsidy schemes (increasing the percentage of the fare being subsidized, changing the number of trips, etc). A randomized trial will allow us to have further understanding of labour outcomes, mobility patterns and design optimal subsidies for the future.

Furthermore, the case of Bogotá also demonstrates that there might be other binding constraints to improving mobility for the urban poor. While the pro-poor subsidy in Bogotá focuses primarily on tackling increased affordability, other constraints such as the location of housing and employment opportunities matter, issues concerning an individual's employment accessibility. This dimension should also be integrated in further research in order to more fully understand the impact of transport demand-side subsidies.

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Notes

[1] This section is largely based on World Bank (2013), and Mehndiratta et al (2014).

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