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How Affordable Is Transportation in Latin America and the Caribbean?

María Eugenia Rivas, Tomás Serebrisky, and Ancor Suárez-Alemán

Abstract

Understanding and recognizing the different transportation conditions and mobility behavior of low-income groups is extremely important for developing and delivering sustainable transportation systems (Lucas et al. 2016). Herein we deepen the understanding of transportation affordability in Latin America and the Caribbean (LAC), with a focus on urban public transportation. The analysis of household expenditure on transportation by expenditure quintile shows that rich households in LAC spent a larger percentage of their expenditure on transportation (17.1 percent) than poorer households (7.7 percent) (Gandelman, Serebrisky, and Suárez-Alemán 2018). Also, as total expenditure increases, expenditure on private transportation increases. Measurement of transportation expenditure may not capture the transportation affordability problem of low-income groups, because fare evasion is higher in deprived areas and poor people may avoid some motorized trips because they are too expensive. We build a transportation affordability indicator and rank cities in accordance to their performance. The results show that the financial burden of a basket of transportation trips for the bottom income quintile exceeds 25 percent in half of the analyzed cities for the 60-trip basket. Transportation subsidies are the most common policy implemented in the region to increase the affordability of transportation, especially for low-income groups. However, their impact in the region has been mixed, showing the need of improving their implementation, particularly in terms of their distributional impacts.

1. Introduction

Transportation affordability has received limited attention from conventional transportation planning (Litman 2017). Recently, there has been a shift in the focus of policy and regulatory debates on infrastructure however, in which analysis of affordability of consumption is replacing the analysis of the cost of investments to provide access (Estache, Bagnoli, and Bertomeu 2018). Several studies have examined transportation affordability at the city level, particularly in Latin America and the Caribbean (LAC).[1]

This analysis is especially relevant for low-income households, for whom transportation expenditure can represent a heavy burden. "Although cost savings may benefit all income classes . . . only savings for lower-income households can be considered to increase affordability" (Litman 2017, p. 5). In 2010 transportation was the fourth-ranked category of household consumption (6.9 percent) for people in the lowest consumption segment (after food and beverages [41.5 percent], housing [14.7 percent], and energy [8.1 percent]) (World Bank 2018). Simultaneously providing affordable transportation services for lower-income populations and achieving financial sustainability in transportation systems can be very difficult (Rodriguez et al. 2016), because large subsidies are need to make fares affordable by the poor.

Lack of affordability can be a strong factor explaining lack of access for certain social groups (Guzman and Oviedo 2018), among whom it can constrain economic opportunities (Litman 2017; Crisp, Gore, and McCarthy 2017). People with low incomes tend to be less mobile than wealthier people and often live in peripheral zones. Understanding and recognizing the different transportation conditions and mobility behaviors of low-income groups is extremely important for developing and delivering sustainable transportation systems (Lucas et al. 2016), where transportation affordability is a key factor.

This note is intended to deepen understanding of transportation affordability in LAC, with a focus on urban public transportation. It is organized as follows. Section 2 analyzes the concept of transportation affordability as a dimension of transportation poverty and its interrelation with other dimensions of transportation poverty and examines the challenges associated with measuring it. Section 3 analyzes household expenditure on transportation by income quintile and creates a transportation affordability indicator, which represents a simplified proxy of affordability. Section 4 reviews strategies to increase transportation affordability, with a focus on transportation subsidies in the region. Section 5 summarizes the main results and presents the policy implications.

2. Defining Transportation Affordability

Carruthers, Dick, and Saurkar (2005, p. 1) define transportation affordability "as the ability to make necessary journeys to work, school, health and other social services, and make visits to other family members or urgent other journeys without having to curtail other essential activities." Affordability captures the relationship between the cost of transportation services and the user's income. A system can be unaffordable not because it is expensive but because household income is very low (Gwilliam 2017). This is particularly relevant to the design of measures to tackle transportation affordability,

[1] For instance, Guzman and Oviedo (2018) assess "pro-poor" public transportation subsidies in Bogota, Colombia with an approach of accessibility, affordability, and equity. Falavigna and Hernandez (2016) analyze inequalities in public transportation affordability in Montevideo (Uruguay) and Cordoba (Argentina). Gómez-Lobo (2009) evaluates affordability policies in Santiago, Chile. Bondorevsky (2007) studies the redistributive impact of public transportation subsidies in Buenos Aires (Serebrisky et al. 2009).

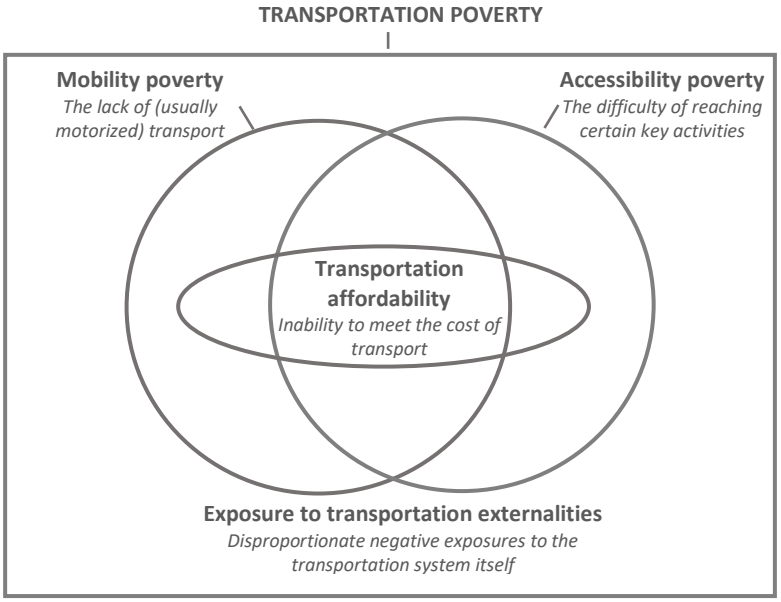
because there is a wide set of measures to increase transportation affordability, of which transportation subsidies are only one alternative.

Analysis of transportation affordability is complex, because of its interrelationship with other transportation concepts and because of the complexity of the transportation sector itself. Lucas et al. (2016) propose a definition of transportation poverty as an overarching combination of subconcepts including transportation affordability, mobility poverty, accessibility poverty, and exposure to transportation externalities:

- Transportation affordability is related to the financial burden households face in purchasing transportation services (Litman 2017).
- Mobility poverty is related to the systematic lack of (usually motorized) transportation options (Lucas et al. 2016).
- Accessibility poverty refers to the difficulty reaching or accessing desired destinations (Gutiérrez 2009).
- Exposure to transportation externalities refers to the disproportionate negative exposures to traffic-related environmental externalities as well as the negative impact on communities living alongside new transportation infrastructures projects and the dislocation that construction sometimes causes (Lucas et al. 2016).

Figure 1 illustrates the interconnections among those concepts. Analysis of one of the aspects affects how policy solutions will be shaped and the understanding of who will be affected by them (Lucas et al. 2016).

Figure 1. Interrelationships among dimensions of transportation poverty



Source: Authors' elaboration based on Lucas et al. (2016).

Because transportation is dependent on location and the physical stock of modal assets, it is difficult to use the average quantitative transportation bundle to approximate the basic needs of individuals (Estache, Bagnoli, and Bertomeu 2018). Measuring transportation affordability is also complicated by the fact that whereas transportation needs are individual, income is a household attribute. Mattioli, Lucas,

and Marsden (2018) suggest considering transportation affordability measures at the household level; complementary approaches can be developed to analyze variation within households.

The definition and use of affordability thresholds in infrastructure services is widespread in the electricity and water sectors.[2] In the transportation sector, the definition of a consumption level requires several caveats. An individual whose spending on transportation exceeds the affordability threshold may have to ration other household expenditures. In high-income levels, however, spending that exceeds the affordability threshold probably does not involve rationing of other household expenditures. In this group, people usually have strong preferences for expensive transportation modes (Estache, Bagnoli, and Bertomeu 2018).

Venter and Behrens (2005) note that the distribution of expenditure on transportation must be monotonic with respect to welfare in order to use it as an unambiguous benchmark indicator. If the share of expenditure devoted to transportation increases, the welfare of consumers must decrease or at least remain constant. Only in this case it is possible to say that consumers improve their welfare by moving from above the benchmark to below it.

Affordability benchmarking is arbitrary. For developed economies, there is no rule regarding thresholds; for developing economies, the transportation threshold is generally 15–20 percent of household income (Estache, Bagnoli, and Bertomeu 2018).[3] Mattioli, Lucas, and Marsden (2018) suggest deriving a transportation affordability metric based on actual expenditure rather than modelled expenditure[4]. Other approaches can be considered to analyze suppressed travel demand.

There is a trade-off between transportation and housing costs. If a household in one city from the bottom quintile spends 15 percent of its expenditure on transportation and a household in another city from the same quintile spends 10 percent, the second household has greater affordability. However, the affordability evaluation changes if the first household spends 10 percent on housing and the second spends 20 percent. It is not therefore possible to infer that better transportation affordability implies higher welfare.

Recently, research on housing and transportation has been reanimated by new patterns of automobile-oriented suburbs as well as interest in housing affordability (Smart and Klein 2018). The best-known affordability indicator is the Housing and Transportation (H+T) Affordability Index developed by the Center for Neighborhood Technology (CNT), which measures the cost of housing and transportation at the neighborhood level in the United States (CNT 2018). This trade-off is starting to be considered in LAC. Avner et al. (2017) analyze the impact of different policies—including the replacement of transportation subsidies by lump-sum transfers—on the combined household budget for transportation and housing in Buenos Aires.

[2] The World Health Organization suggests a threshold of 5 percent of income for water and sanitation and 3.5 percent for water. The rule of thumb for electricity and gas in developing countries and emerging economies is 4–5 percent of household income (Estache, Bagnoli, and Bertomeu 2018).

[3] Armstrong-Wright and Thiriez (1987) were the first to define a reasonable threshold for bus travel in developing countries as not exceeding 10 percent of household income.

[4] For example, Nicolas et al. (2012) consider a vulnerability threshold of twice the average household expenditure on transportation.

3. Measuring Transportation Affordability

Several indicators have been developed to measure transportation affordability.[5] This section presents a regional analysis of household expenditure on transportation and calculates a transportation affordability indicator.

3.1. Household Expenditure on Transport

3.1.1. Overview

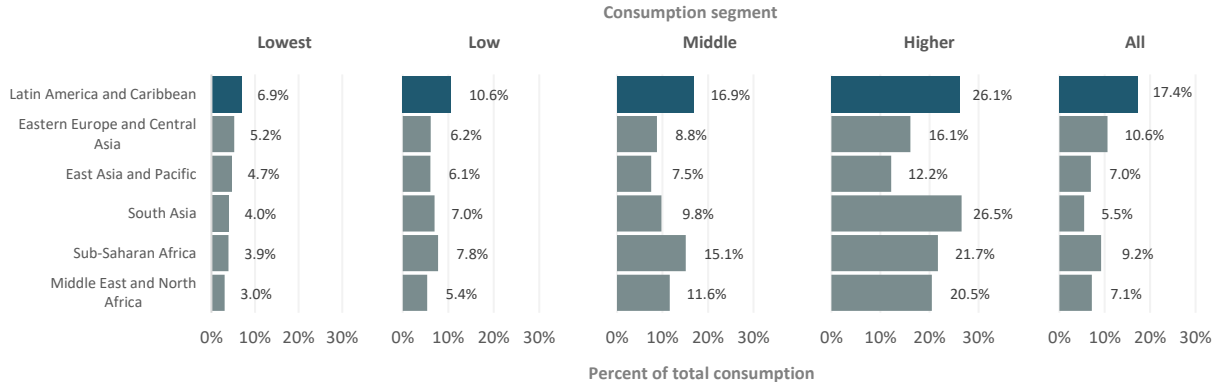
There is no perfect indicator that allows a city to determine whether its transportation is sufficiently affordable. However, analysis of household expenditure on transportation allows planners to analyze the monetary pressure of mobility on households at different socioeconomic levels. Household expenditures on transportation include expenditure on private transportation (vehicles, fuels and lubricants, maintenance, and other associated services) as well as public transportation. It captures real travel consumption and access to subsidized fares.

In 2010 the share of transportation in total consumption in 10 LAC countries (Bolivia, Brazil, Colombia, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, and Peru) averaged 17.4 percent, according to the World Bank (2018) (Figure 2). This share is higher in LAC than in other regions. In the lowest consumption segment, transportation accounted for 6.9 percent of household consumption in LAC, 5.2 percent in Eastern Europe and Central Asia, 4.7 percent in East Asia and Pacific, 4.0 percent South Asia, 3.9 percent in Sub-Saharan Africa, and 3.0 percent in the Middle East and North Africa in 2010.

The share of transportation in total consumption increases with total consumption, thanks to spending on cars in countries in the Organisation for Economic Co-operation and Development (OECD) (Kauppila 2011).The same pattern is observed in developing countries, where household expenditure on private transportation represents 15.1 percent of household expenditure and public transportation 2.0 percent for the highest quintile and 1.7 percent and 6.0 percent, respectively, for the lowest quintile (Gandelman, Serebrisky, and Suárez-Alemán 2018). Transportation affordability issues are thus related mainly to the affordability of public transportation in low-income groups in LAC.

[5] Construction of these indicators differs in several ways, including the income measure considered (based on income or expenditure, individual or household, and so forth); the fare measure used (actual or theoretical expenditure, type of fare, and so forth); and the measure of poverty defined (most use income quintile) (Carruthers, Dick, and Saurkar 2005).

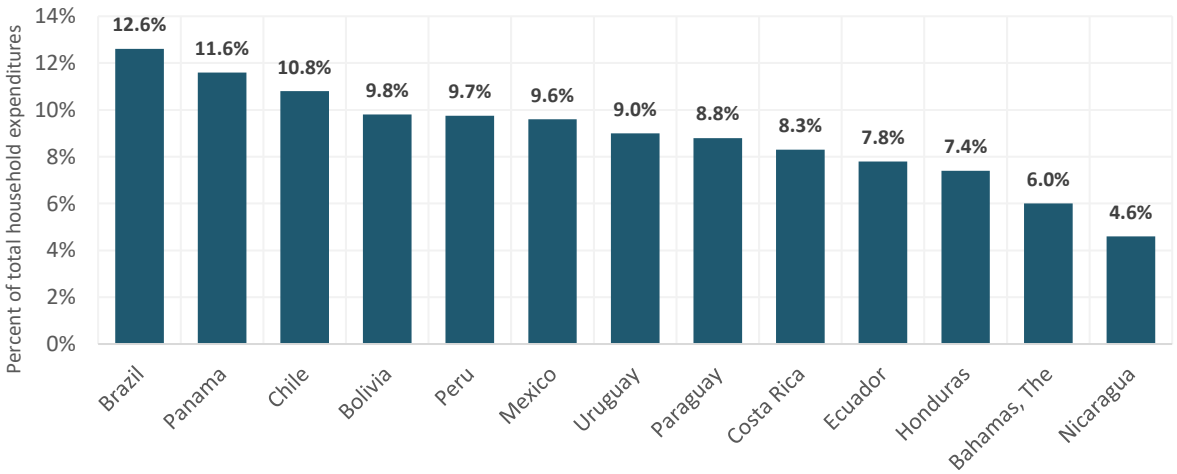
Figure 2. Share of transportation in total consumption, by region and consumption segment, 2010



Note: Figures are based on purchasing power parity values.
Source: Authors' elaboration based on World Bank (2018).

For another group of countries (Bahamas, Bolivia, Brazil, Chile, Costa Rica, Ecuador, Honduras, Mexico, Nicaragua, Panama, Paraguay, and Uruguay), Gandelman, Serebrisky, and Suárez-Alemán (2018) find that annual average household transportation expenses represented 4.6-12.6 percent of total household expenditure in 2014; Nicaragua, Bahamas, and Honduras had the smallest shares, and the Brazil, Panama, and Chile had the largest (Figure 3). In the European Union the share was 12.8 percent in 2014 (OECD 2018). Rich households in LAC spent a larger percentage of their expenditure on transportation than poorer households. The share of transportation expenditure increases with expenditure quintile, from 7.7 percent in the bottom quintile to 17.1 percent in the highest quintile (Figure 4).[6]

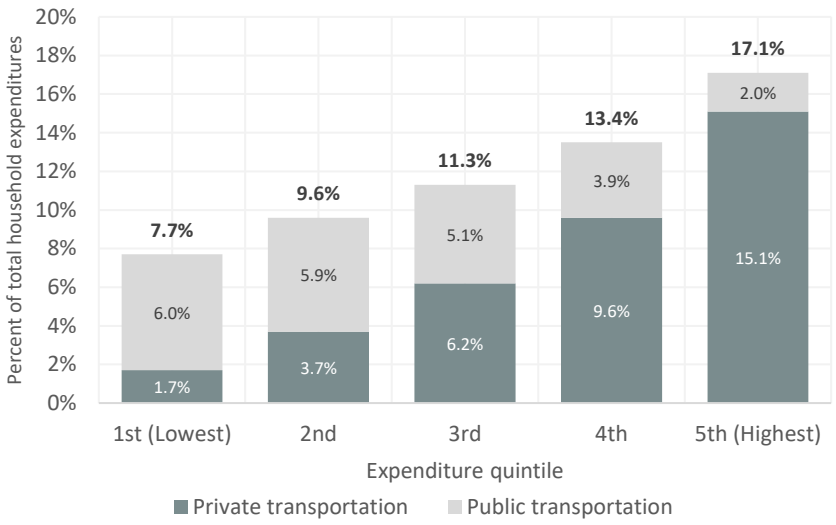
Figure 3. Share of transportation expenditures in total household expenditures in selected countries in Latin America and the Caribbean, 2014



Source: Authors' elaboration based on Gandelman, Serebrisky, and Suárez-Alemán (2018).

[6] The literature identifies household transportation expenses by income quintile and by expenditure quintile. For a discuss of the implication of the choice, see Gandelman, Serebrisky, and Suárez-Alemán (2018).

Figure 4. Average household transportation expenses in Latin America and the Caribbean, by expenditure quintile, 2014



Source: Authors' elaboration based on Gandelman, Serebrisky, and Suárez-Alemán (2018).

Household spending on private transportation in LAC represents about 76 percent of total expenditure on transportation (Gandelman, Serebrisky, and Suárez-Alemán 2018).[7] The pattern of spending is different for private and public transportation. As total expenditure increases, expenditure on private transportation increases. Households from the bottom quintile spend 1.7 percent of their total expenditure on private transportation, whereas households in highest expenditure quintile spend 15.1 percent. The share of spending on public transportation decreases, from 6.0 percent in the bottom expenditure quintile to 2.0 percent in the highest quintile. This evidence and the growth of the middle-class help explain the large increase in the motorization rate in LAC in the last few years[8] and the declining use of public transportation in some cities in the region.[9]

Gandelman, Serebrisky, and Suárez-Alemán (2018) find that public transportation is a necessity, with an expenditure elasticity of 0.5. Private transportation is a luxury, with an expenditure elasticity of 2.6. Public transportation is a necessity for the bottom four expenditure quintiles and an inferior good for the top quintile (when household expenditure budget increases, absolute spending on public transportation falls). Fuel transportation is a luxury for the bottom four expenditure quintiles and a necessity for the top quintile.

[7] Cross-country differences are wide. In Bolivia, for example, spending on public transportation is three to four times higher than spending on private transportation; in Brazil, Uruguay, and Costa Rica, spending on private transportation is four to five times higher than spending on public transportation (Gandelman, Serebrisky, and Suárez-Alemán 2018). Appendix figure A.1 shows spending by country.

[8] The motorization rate in LAC increased by 60 percent between 2005 and 2015, according to data from the International Organization of Motor Vehicle Manufacturers (OICA) and population data from the World Bank.

[9] In Montevideo, for instance, the share of public transportation decreased from 26.9 percent of all trips in 2009 to 25.2 percent in 2016 (Mauttone and Hernández 2017). In Santiago it decreased from 33.1 percent in 2001 to 29.0 percent in 2012 (Herrera and Razmilic 2016). In Belo Horizonte, it fell from 44.6 percent in 2002 to 28.1 percent in 2012 (BHTRANS 2015).

3.1.2. Transportation expenditure by low-income households

Measurement of transportation expenditure may not capture the transportation affordability problem of low-income groups, for two reasons. First, fare evasion is higher in deprived areas. Second, poor people may avoid some motorized trips because they are too expensive.

Poor people often find it difficult to pay for trips. In New York low-income riders travel by "evading the fare, exploiting free transfers, forgoing goods, borrowing, and using free fare cards" (Perrotta 2016, p. 1). In LAC bus fare evasion has been estimated at 27.6 percent in Santiago, 15.0 percent in Bogota, 12.0 percent in Buenos Aires, and 10.0 percent in Lima in 2016 (Troncoso and de Grange 2017). Guarda et al. (2016) find that fare evasion in Santiago is higher at bus stops located in low-income areas than in high-income areas, suggesting a link between fare evasion and inability to afford bus fares. Fare evasion in the region means that transportation expenses are underestimated, particularly for the poor.

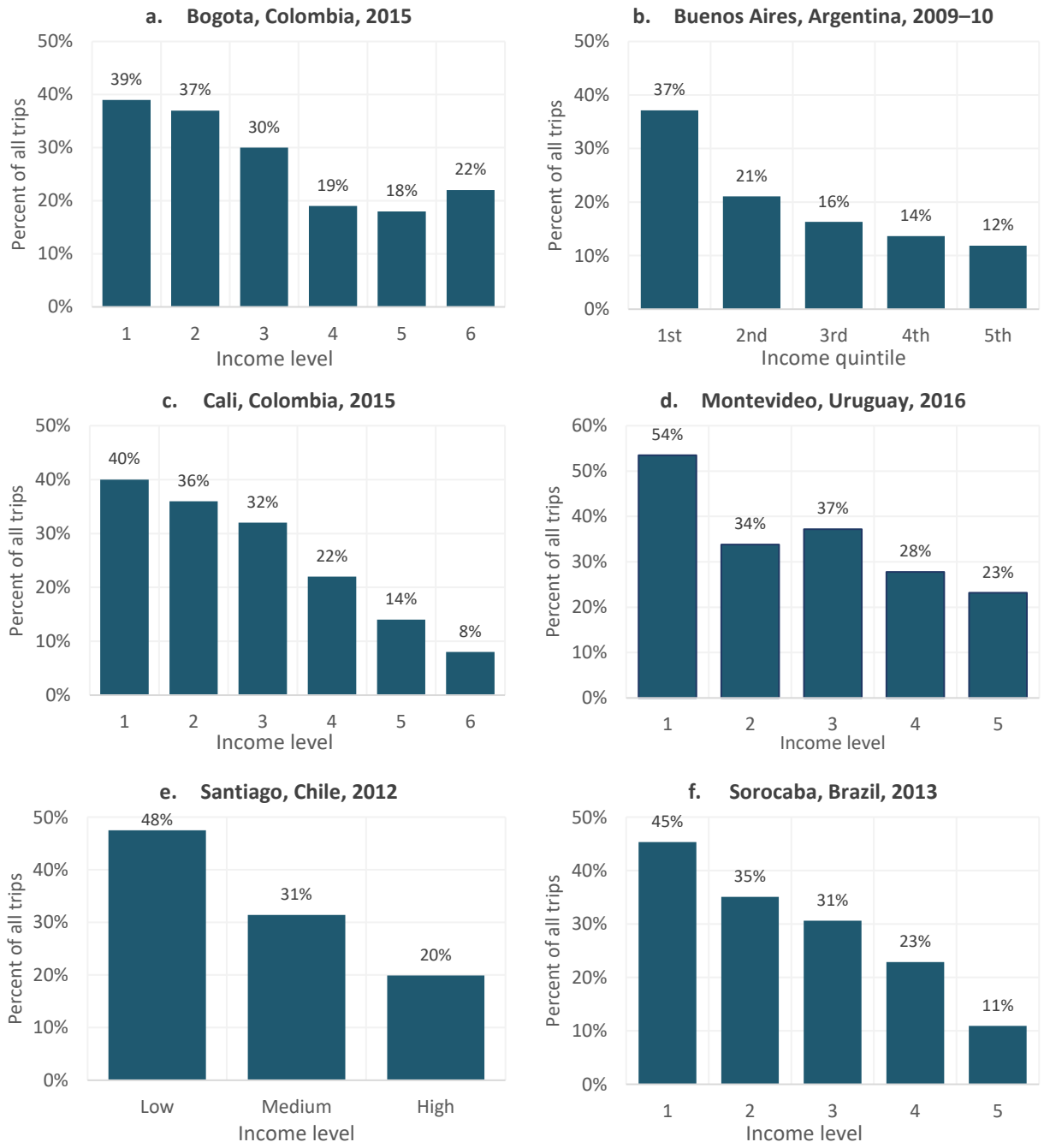
In some LAC cities, walking represent about 40–45 percent of all trips by low-income people; the figure for higher-income groups is 10–20 percent (Figure 5).[10] Poor people may sacrifice some motorized trips because of affordability, becoming "captive walkers" and walking long-distances (Venter and Behrens 2005; Falavigna and Hernandez 2016). In Rio de Janeiro, for example, many people who lack access to Vale-Transporte (a commuter voucher) are forced to walk; although the location of schools and health centers within walking distance of people's home has reduced the need for motorized trips (MDT-FNRU 2015).

These findings are important for designing transportation policies that benefit low-income groups. "Subsidies that operate through public transportation fares do not reduce the out of pocket cost of the mode chosen by many poor people, and a significant amount of benefits will accrue to higher-income households" (Serebrisky et al. 2009, p. 39). The main objective of affordability policies is to enable people to make all trips necessary to access education, health, work, and social services without forcing them to forgo essential activities.

Affordability policies have two main impacts on mobility patterns. First, they can incentivize more intense use of public transportation. Second, they can facilitate a shift from walking to public transportation for long distances, although this impact is often modest. Fearnley et al. (2017) find that the average cross-elasticity of demand for walking and cycling travel with respect to public transportation fares is 0.053 (based on 13 reported estimates). This means that on average, a 1 percent reduction in fares reduces walking and cycling travel by only 0.053 percent. This result may suggest that in order to improve the transportation conditions for poor people, cities should invest in pedestrian and bicycle facilities, as some cities in the region are doing (see, for example, Rodriguez Porcel et al. 2017 and UN Environment 2016).

[10] Motorcycle trips represent a higher percentage of trips among low-income households than high-income households. In Montevideo, for instance, motorcycles trips represents 8.5 percent of trips in the lowest quintile and 1.0 percent in the highest quintile; bicycle trips represent 2.4 percent and 3.7 percent of all trips for the first and second quintiles, respectively, and 2.2 percent for the highest quintile (Mauttone and Hernández 2017).

Figure 5. Percent of all trips made by walking in selected cities in Latin America and the Caribbean, by income level



Note: Figures show walking trips that were the main transportation mode, except in Buenos Aires, where figures include people who walked just part of the trip.

Source: Authors' elaboration based on data from Transconsult-Infométrika (2015), UEC Movilidad (2010), SDG-CNC (2015), Mauttone and Hernández (2017), MTT (2015), and URBES-LOGIT (2013).

3.2. Transportation Affordability Indicator

Despite their limitations, affordability measures are useful approximations of transportation affordability, especially for analyzing the financial burden of transportation costs on certain groups of the population. Affordability indexes can help policy makers make decisions about current or potential subsidies (Fay et al. 2017). An example is the analysis of Buenos Aires by Mehndiratta, Rodríguez, and Ochoa (2014).

An affordability measure can be defined as the percentage of monthly income (or expenditure) allocated to transportation (Gómez-Lobo 2011a):

$$Affordability\ Indicator_1 = \frac{\sum_{i=1}^{N} x_i(p_i, y) \times p}{y} \quad (1)$$

where $x_i(p_i, y)$ is the number of trips made by household member i, expressed as a function of the price of trips (p_i) and household income (y). This measure is compared with a defined affordability benchmark for the transportation sector.

A misinterpretation of public transportation expenses by income level can lead to the recommendation that only middle-income groups require subsidies, because they are the only group whose spending exceeds the affordability benchmark. However, this benchmark does not fully consider the fact that low-income households often reduce the number of trips they take because of the high cost or quantify the shadow cost of walking, which would increase transportation expenditures by poor households, as Serebrisky et al. (2009) note.[11]

Carruthers, Dick, and Saurkar (2005) overcome this problem by considering a fixed basket of trips. They create an affordability indicator that estimates the percentage of average per capita income of the bottom quintile of the income distribution of the cities under analysis needed to make 60 trips a month:

$$Affordability\ Indicator_2 = \frac{\sum_{i=1}^{N} \overline{x_i} \times p}{y} \quad (2)$$

where $\overline{x_i}$ represents the fixed number of trips taken by household member i. This indicator does not consider the fact that public transportation supply would probably change if every resident made this fixed number of trips a month, as Serebrisky et al. (2009) note. Equilibrium fares would change unless there are constant economies of scale in supply.

Following Carruthers, Dick, and Saurkar (2005), we consider a fixed basket of 60 trips and a representative single fare, considering an average distance of 10 kilometers[12] when fares are based on distance and 60 minutes when fares are based on time. The basket of 60 trips is based on a round-trip ticket per day. We also consider a more conservative basket of 45 trips a month, corresponding to a round-trip ticket on all working days (22.5 days a month).

[11] In order to address this issue, Fan and Huang (2011, p. 11) incorporate the time dimension in the concept of transportation affordability, defining affordability as a "household's capacity to pay transportation costs (including both monetary and time-based costs) without incurring financial difficulties and time pressures."

[12] The distance of 10 kilometers is consistent with average distances of public transportation systems in LAC (except in Mexico City, where the average trip distance is 19.2 kilometers) (Muñoz, Batarce, and Torres 2016).

The structure of fares can be very complex in some cities. The customization of fares fostered by technological advances has allowed ticketing based on zones, distance, time, or a hybrid. The analysis here is based on the single fare, not a weekly or monthly ticket. The data were collected from governments and operators (reports and websites), as well as through contacts of Inter-American Development Bank Country Offices, in 2018.

Average per capita urban income for the country and for the bottom quintile of income distribution were used for the set of countries studied in Gandelman, Serebrisky, and Suárez-Alemán (2018). The household income data from 2014 of that study were updated based on the percentage change in per capita GDP since then. Table 1 presents the main assumptions and sources of information.

Table 1. Inputs into the Transportation Affordability Indicator

Measure	Description
Fare	• Representative single daily; average distance of 10 kilometers when fares are based on distance and 60 minutes when fares are based on time (see table A.1. in appendix) • Average of fares when ticketing based on routes • Fare at peak hour • Fare with electronic payment
Quantity of travel	• 60 trips a month 12 months a year • 45 trips a month 12 months a year
Income	• Average per capita urban income for the country (based on Gandelman, Serebrisky, and Suárez-Alemán 2018). • Average per capita urban income of bottom quintile of income distribution for the country (based on Gandelman, Serebrisky, and Suárez-Alemán 2018).

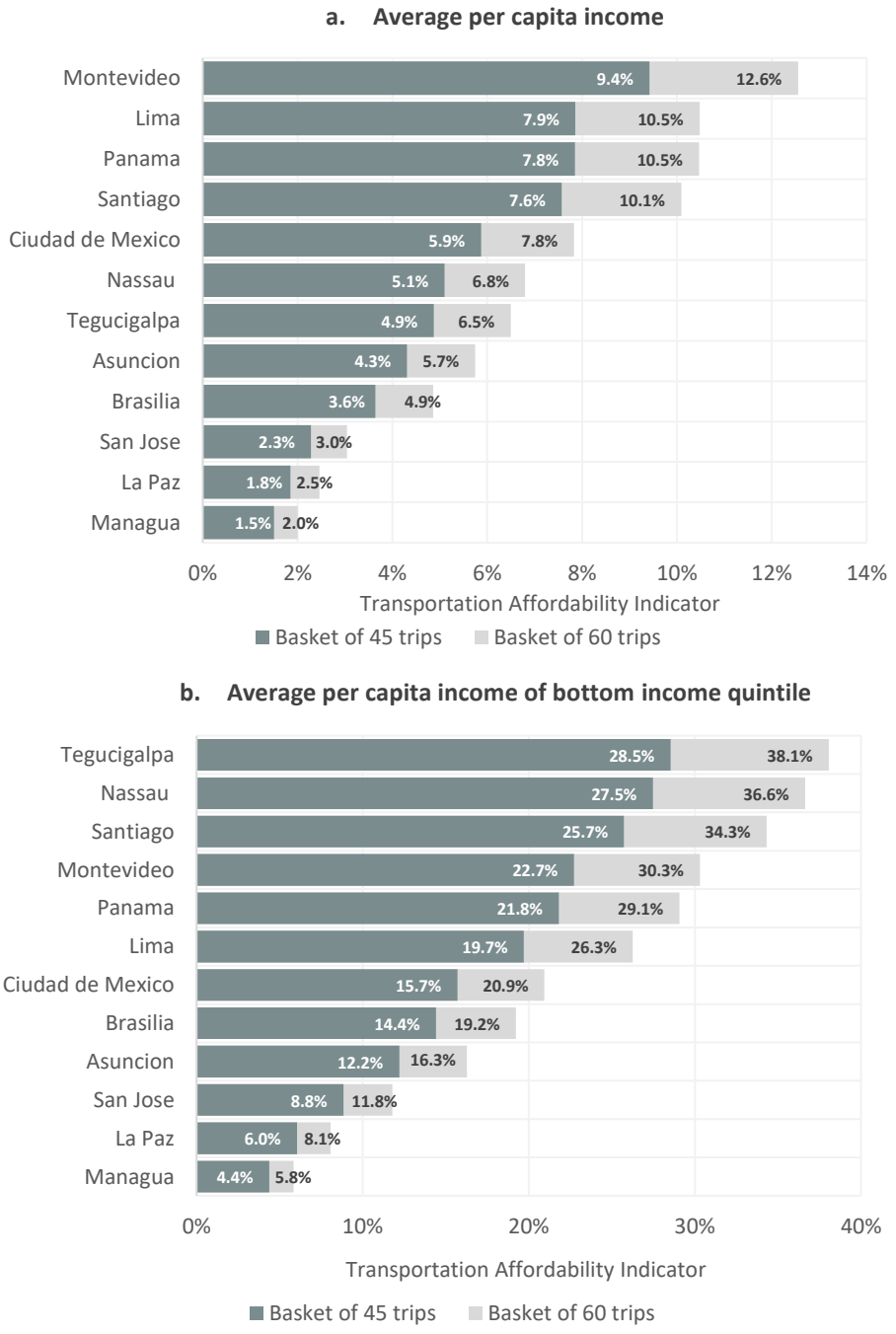
Source: Authors' elaboration.

Transportation affordability indicators make it possible to rank cities based on the financial burden of a basket of transportation trips. Based on average per capita income, Montevideo has the highest transportation affordability indicator (12.6 percent for the 60-trip basket), followed by Lima (10.5 percent) and Panama City (10.5 percent). San Jose (3.0 percent), La Paz (2.5 percent), and Managua (2.0 percent) are at the bottom of the ranking (Figure 6, panel a).

The ranking changes significantly when only the bottom income quintile is considered (Figure 6, panel b). Tegucigalpa (38.1 percent), Nassau (36.6 percent), and Santiago (34.3 percent) are at the top, and San Jose (11.8 percent), La Paz (8.1 percent), and Managua (5.8 percent) are at the bottom. The affordability indicator for the bottom income quintile exceeds 25 percent in six cities (Tegucigalpa, Nassau, Santiago, Montevideo, Panama City, and Lima) for the 60-trip basket and in three cities (Tegucigalpa, Nassau, and Santiago) for the 45-trip basket.

Several cities in the region have transportation subsidies targeted to the poor based on geographical zones (for example discount of 50% of the fare mainly in peripheral zones in Montevideo) or based on income (for example pro-poor public transportation subsidy in Bogota). This type of subsidies may improve significantly the transportation affordability of those users receiving the benefits. It is important to highlight that the transportation affordability indicator used herein is developed considering a single basic ticket which does not include this type of demand-side subsidies.

Figure 6. Transportation Affordability Indicator of Selected Cities in Latin America and the Caribbean, 2018



Source: Authors' calculations based on data from Gandelman, Serebrisky, and Suárez-Alemán (2018), governments and operators and contacts of Inter-American Development Bank Country Offices.

4. Policies to Increase the Affordability of Transportation

4.1. Overview

Increasing the affordability of transportation requires the development of complex pricing structures and targeted subsidies that reduce the financial burden on users, particularly low- and middle-income users, without imposing an unsustainable financial burden on taxpayers (Estache, Bagnoli, and Bertomeu 2018). It is possible to classify measures to increase transportation affordability according to three drivers: income, price, and energy efficiency (Table 2).

Table 2. Policies to increase the affordability of transportation

Driver	Policies
Income	• Public transportation: Demand-side subsidies, such as transportation vouchers and direct transfers using the welfare system
	• Income tax deductions for commuting
Price	• Discounted or reduced fares for vulnerable groups, concessionary travel passes
Energy efficiency	• Densification and compact city policies
	• Improvement of public transportation services
	• Encouragement of inner-urban residential location

Source: Authors' elaboration based on Mattioli, Lucas, and Marsden (2018).

In LAC transportation subsidies are the most common policy implemented to increase the affordability of transportation, especially for low-income groups. Other measures—such as densification subsidies in Mexico City, Lima, and Rio de Janeiro—have been implemented (World Bank 2013) but not with the main objective of increasing transportation affordability.

4.2. Transportation Subsidies

The literature identifies two efficiency arguments for transportation subsidies. First, scale economies may arise from fixed costs, such as track and station maintenance but mainly from users, an effect known as the Mohring effect (Mohring 1972 in Parry and Small 2009). It implies that as service frequency or route density increases, waiting or access costs fall for all users. Therefore, an increase in demand generates a positive externality on existing users. Subsidizing public transportation is therefore a first-best pricing solution (Gómez-Lobo 2011b).

Second, lower fares discourage automobile usage, reducing its negative externalities (traffic congestion, air pollution, and traffic accidents) (Parry and Small 2009). It constitutes a "second-best" argument, because it assumes that these externalities cannot be internalized through road pricing. Gwilliam (2017) notes that urban transportation can be considered a "merit good"—a good that is undervalued by consumers and generates positive externalities—providing an economic justification for subsidies, which redistribute welfare.

The fact that transportation is important to improve people's lives is not enough to justify subsidies; because this argument can also be used to justify subsidies of many other goods and services (Serebrisky et al. 2009). Monetary transfers can be a better way to help the poor than sectorial subsidies. However, there may be special reasons to subsidize certain goods or services—in order to ensure access to education or health services, for example, or because of the lack of a well-functioning welfare system that

makes it difficult to administer cash transfers. Indeed, many low-income countries have relied on targeted subsidies rather than cash transfers because they lack administrative and implementation capacity (Gwilliam 2017). Transportation subsidies can also be used to redistribute income, although evidence of their progressivity is mixed (Asensio, Matas, and Raymond 2003).

Transportation subsidies can be divided into supply-side subsidies (channeled to transportation suppliers) and demand-side subsidies (channeled directly to beneficiaries). They can be classified based on how they are distributed or how they are funded (general tax, specific taxes, and cross-subsidies) (Table 3). The analysis of funding is particularly relevant when subsidies pursue a redistributive objective.

Table 3. Transportation subsidy typology

Type of subsidy	Selection mechanism	Funding source
Demand side	• Means tested: A welfare instrument is used to gauge the socioeconomic condition of potential beneficiaries, • Categorical: Subsidies are given to certain categories of people, such as students or older people. • Self-selection: Lower-quality services are subsidized for example. • Geographical: Benefits and services are targeted to areas where less well-off households are overrepresented.	• General tax • Local or specific taxes • Cross-subsidies
Supply side	• Conditional: Conditional on certain performance targets • Unconditional	• General tax • Local or specific taxes • Cross-subsidies

Source: Authors' elaboration based on Serebrisky et al. (2009).

4.2.1. Demand-side subsidies in Latin America and the Caribbean

Subsidies for public transportation have been a common approach in LAC to increasing affordability (Table 4). The evidence on their effectiveness is mixed, because of problems identifying and benefiting targeted groups and potential abuse of subsidies (Fay et al. 2017; Hernández and Peralta-Quiros 2016). Even though perfect targeting in subsidies is impossible, demand-side subsidies are still preferable to supply-side subsidies because they can be better targeted (Serebrisky et al. 2009). Subsidies may not reach their intended beneficiaries, however, because many poor people do not have access to public transportation (Serebrisky et al. 2009) or do not use public transportation, instead using informal transportation modes, such as vans and micro buses (Fay et al. 2017).

Mehndiratta, Rodríguez, and Ochoa (2014) identify two generations of subsidies. The "first generation" of subsidies—many of which remain in effect—was not efficient in reaching the targeted audience and may have had unintended results. Programs include *Vale Transporte* in Brazil; cable cars and *Billete Único* in Rio de Janeiro; feeder lines in Medellín; and subsidies targeting students, seniors, and people with disabilities (most of the region also provides free passes to members of the national police and other categories of workers). The use of transportation subsidies for specific groups of the population is widespread in LAC countries. Based on the analysis of transportation policies in Santiago, Gómez-Lobo

(2009) shows that at first glance the preferential fare policy in the bus system for students seems to be progressive. However, when the funding source is included (cross-subsidy from normal fares), the progressivity of the policy significantly decreases. Poor households are negatively affected by the surcharge on normal fares and pay a higher proportion of this tax than do wealthier households.

A new group of subsidies emerged in recent years, supported by smart card technologies.[13]Smart technologies in transportation improve operational efficiency, pricing flexibility, and the targeting of subsidies and reduce the misuse of subsidies (Gwilliam 2017). In 2014 the local government in Bogota introduced a pro-poor public transportation subsidy using a social policy targeting mechanism called SISBEN to classify potential beneficiaries and allocate subsidies. SISBEN uses several socioeconomic characteristics of individuals and households to assign a score between 0 and 100, which is used as a proxy of poverty (Guzman and Oviedo 2018). Households below the threshold of 30.56 are given access to discounted fares on 30 trips a month, through a special smart card (SITP 2018). In 2015 the subsidy represented a 50 percent discount on Transmilenio services and a 60 percent discount on zonal-component trips (Guzman and Oviedo 2018). The subsidy increased the number of trips by beneficiaries by 56 percent when compared to normal trips (Rodríguez Hernández and Peralta-Quiros 2016). Analysis of the current structure as well as alternative scenarios for increasing its coverage show that both are progressive, with a positive impact on accessibility and equity (Guzman and Oviedo 2018).

[13] Another use of smart technologies is biometric identification. In 2011 the city of Aracaju, Brazil introduced biometric identification of beneficiaries of free travel passes and discounted fares (SETRANSP 2018).

Table 4. Description of selected demand-side transportation subsidies in Latin America and the Caribbean*

Program	Selection mechanism	Funding source	Description
Vale Transporte Brazil (employer-sponsored transportation voucher introduced in 1985)	• Mix of categorical and self-selected mechanism: Employers withhold 6 percent of employees' gross salary. In return, employees receive monthly vouchers for trips to and from work (Law 7.418/1985). Employees from higher-income groups usually opt out of the system, because transportation costs are less than 6 percent of their salaries (Serebrisky et al. 2009).	• Local or specific taxes	• Helps very poor people who are formally employed. • Does not benefit informal workers (37 percent of Brazil's workforce in 2013 (Cardoso 2016)) or the unemployed. • Incentivizes employers to not employ people who live far away (Rebelo 2013). • Is vulnerable to fraud when not electronic (Rebelo 2013). • Provides incentives for frequent fare increases (Rebelo 2013).
Cable cars, Rio de Janeiro (implemented in 2011, suspended in 2016)	• Geographical: Two free trips per day for residents of Complexo do Alemão (Izaga and da Silva Pereira 2014).	• General tax revenues	• Only 10 percent of population of Complexo do Alemão was registered to travel free (Izaga and da Silva Pereira 2014). People continued using *kombis* (Volkswagen vans) and moto-taxi (Santos 2014). • Excludes low-income households living elsewhere in the city (Mehndiratta, Rodríguez, and Ochoa 2014).
Discounts for students, seniors, and people with disabilities, Several cities	Categorical subsidies: • Montevideo (Uruguay): Students, seniors, and people with disabilities.[a] • Panama: Students, seniors, and people with disabilities.[b] • Peru: Students and people with disabilities.[c] • Rancagua, Valparaíso, Gran Concepción, Iquique-Alto-Hospicio, and Antofagasta (Chile): discounted fares mainly for student fares.[d] • Santiago (Chile): Students and seniors.[e]	• Cross-subsidy / General tax revenues	• Systems with inclusion and exclusion errors (Mehndiratta, Rodríguez, and Ochoa 2014). • Subsidized fares for students in Chile funded by cross-subsidies before 2010 and by *Fondos Espejo* after 2010.[f] In March 2010 the subsidy reduced Metro Valparaíso fares by 100 percent for primary students and by 66 percent for secondary and higher-education students (Metro Valparaíso 2010); fares for all other passengers fell 18 percent. Ridership increased 15 percent in 2011 (excluding March of both years, because of the distortion caused by the 2010 earthquake [Metro Valparaíso 2011]). • Surcharge on regular fare to subsidize student fares in the bus system in Santiago has regressive impact (Gómez-Lobo 2009).

Program	Selection mechanism	Funding source	Description
Bilhete unico (unified ticket), São Paulo (implemented in 2004)	• Geographical (São Paulo)	• Cross-subsidy	• Free transfers provided between buses and trains (World Bank 2017), subsidizing transfers for multimodal trips, with a positive impact on low-income users (Rodríguez Hernández and Peralta-Quiros 2016). • Share of low-income rail users increased from less than 5 percent to 35 percent after fare integration (World Bank 2017). • May contribute to sprawl (Rodríguez Hernández and Peralta-Quiros 2016).
Pro-poor subsidies, Bogota (implemented in 2014)	• Mixed mean tested and self-selection: Proxy-means tested using SISBEN database and self-selection. Among the main determinants of user's "self-selection" are word of mouth, employment status, and gender.	• General tax revenues	• Number of monthly trips increased among 56 percent of subsidy beneficiaries (Rodríguez Hernández and Peralta-Quiros 2016). • Job accessibility in the periphery and low-income areas improved (Guzman and Oviedo 2018). • Transportation subsidies are most efficient and effective in low-income areas (Guzman and Oviedo 2018).

* The subsidies shown in the table are not exhaustive neither within the region nor within countries.

a. Free trips for primary and high school students, people with disabilities, children under 12, people over 70 on Sundays and public holidays; discounted fares for pensioners and higher-education students (Hernández 2017).

b. Discounted fares for students with a Metro Bus student card (ATTT 2018), people with disabilities, seniors (over 55 for women and over 60 for men), renters, and pensioners (Executive Decree No. 400/2014).

c. Free passes for urban and interurban transportation for higher-education and primary school students (Law No. 26.271) and free passes on all public transportation for people with disabilities (Law No. 30.412).

d. Law No. 20.378 of 2009 subsidizes public transportation fares in regions through two modalities. In tendered areas or cities with regulated transportation systems (Iquique-Alto-Hospicio, Antofagasta, Valparaíso, Rancagua, and Concepción) general fares are reduced. In nontendered areas or cities with non-\regulated transportation systems (Calama, Chillán, Copiapó, Coquimbo, Coyhaique, La Serena, Osorno, Puerto Montt, Talca, Temuco, and Valdivia, among others), student fares were cut to one-third the regular adult fare in Santiago (DTPR 2018b).

e. Discounted fares (around one-third the regular adult fare) for students and discounted metro fares for seniors (over 60 for women and over 65 for men) through a smart card (Transantiago 2018).

f. Law No. 20.378 of 2009 created a national public transportation subsidy differentiating Transantiago and the rest of the country. It established that the total amount of subsidies spent in Transantiago must be mirrored in the rest of the regions in the country (*Fondos Espejo*).

Source: Authors' elaboration.

4.2.2. Supply-Side Subsidies in Latin America and the Caribbean

Supply-side subsidies are transfers made by the government to transportation suppliers to subsidize infrastructure or operating costs. The objective is to reduce the cost of services to users by lowering the part of costs to be funded from fares (Serebrisky et al. 2009).

Conditional supply-side subsidies are linked—partially or totally—to performance indicators of transportation operators, such as the number of passengers carried, or kilometers traveled. Direct transfers to operators in Buenos Aires are an example of this type of subsidy. Unconditional supply-side subsidies are not linked to performance or the fulfillment of other objectives of the system.

Supply-side subsidies are less targeted than demand-side subsidies, because transportation operators do not identify different types of users (except for subsidies conditional on performance targets or specific services, such as financing nonviable rural services (Serebrisky et al. 2009)). In remote areas of Chile, for example, the main objective of supply-side subsidies is to provide communities with better territorial, economic, and social integration (DTPR 2018a). Table 5 describes selected supply-side subsidies in the region.

Table 5. Description of selected supply-side transportation subsidies in Latin America and the Caribbean*

Program	Selection mechanism	Funding source	Description
Direct transfers to transportation operators (Buenos Aires)	• Conditional	• General tax revenues, local or specific taxes	• Subsidy level depends on number of passengers carried and kilometers supplied (ASAP 2014; Resolution 396–E/2016).
Purchase of public transportation vehicles (Chile 2009, Paraguay 2014, Brazil)	• Conditional and unconditional	• General tax revenues	• In Chile, regional governments received subsidies funded by the national public transportation subsidy for renovating buses, minibuses, trolleybuses, and taxibuses (Decree No. 44/2011). • In 2014 Paraguay approved a program to renovate the public transportation fleet. The operators received $30 per bus for replacing 20-year-old vehicles (Decree No. 2130/2014). • BNDES, the Brazilian development bank, provides financing on favorable terms for public transportation provision.
Subsidies in remote zones (Chile 2009)	• Unconditional	• General tax revenues	• Subsidies help implement public transportation in remote areas and areas with difficult access (DTPR 2018c). • Maximum fares are regulated by bidding and contracts; they are adjusted annually based on the Consumer Price Index (DTPR 2018a).
Fuel subsidies (Argentina 2003, Panama 2009, Uruguay 2006)	• Unconditional	• General tax revenues, local or specific taxes	• Argentina provides a preferential price for diesel for public transportation operators; a quota of a preferential diesel price is established over the total diesel volume based on the number of vehicles, the type of chassis of the operator, total kilometers covered monthly, the average consumption per type of chassis, and coefficients for unproductive kilometers and consumption (Resolution No. 23 / 2003 Secretaría de Transporte). • Panama subsidizes public transportation by distributing coupons for discounts on diesel that can be redeemed at participating service stations (Di Bella et al. 2015). • Uruguay's *Fideicomiso del Boleto* seeks to reduce the price of public transportation by reducing the final price of diesel for these activities; the payment is a function of the declared diesel consumption and ceilings established by the Ministry of Transportation and Public Works (CND 2018).

* The subsidies shown in the table are not exhaustive neither within the region nor within countries.

Source: Authors' elaboration.

5. Policy Implications

Transportation subsidies are widespread in LAC; they are the main policy lever used to increase transportation affordability. Cities in the region have implemented various types of subsidies, including demand-side and supply-side subsidies, using different selection mechanisms and funding sources. Because they can target beneficiaries, demand-side subsidies are preferable to supply-side subsidies, but their impact in the region has been mixed.

Analysis of the distributional effects of transportation policies is extremely important to developing pro-poor policies. Inclusion and exclusion indicators as well as Lorenz curves and quasi-Gini coefficients can be used to assess the impact on the poor (Gwilliam 2017). In particular, relative benefit curves and the associated Gini coefficients are more fruitful for studying the distributional impact of transportation subsidies than affordability measures (Gómez-Lobo 2011a).

Public transportation subsidies can target poor people using national targeting systems (Mehndiratta, Rodríguez, and Ochoa 2014) and achieve significant distributional impacts (Serebrisky et al. 2009). Bogota has allocated subsidies in an efficient way through a social policy targeting mechanism (SISBEN). As a result of these subsidies, the number of monthly trips by beneficiaries rose 56 percent (Mehndiratta, Rodríguez, and Ochoa 2014), and the most efficient and effective results were in low-income areas (Guzman and Oviedo 2018). Smart card technology can be used to provide cash transfers rather than in-kind benefits to poor people (Gwilliam 2017).

Fares represent half the total operating costs of urban public transportation among global cities (Cervero 2011). Parry and Small (2009) analyze fare subsidies in rail and bus transportation, taking into account congestion, pollution, and accident externalities; scale economies; and agency adjustment of transportation service offerings. Their findings indicate that the large fare subsidies in Washington, DC, Los Angeles, and London are efficient and that incremental fare reductions leads to welfare improvements across transportation modes and cities. No comprehensive assessment has been conducted of which type of subsidy is best.

The effectiveness of implementing transportation subsidies depends on whether other policies are already implemented. Basso and Silva (2014) analyze transportation subsidies, dedicated bus lanes, and car congesting pricing in London and Santiago. They find that in the absence of other measures, transportation subsidies can be very effective at increasing social welfare. The contribution of transportation subsidies diminishes significantly if other policies (bus lanes or congesting prices) are implemented first. If policy makers want to help the poorest, they should therefore first implement transportation subsidies, which do more to redistribute income than alternative policies.

Cash transfers to low-income households may be a better way of helping the poor, however (Serebrisky et al. 2009). They may outperform sectoral subsidies in the region. Avner et al. (2017) find that replacing transportation subsidies with a lump-sum transfer in Buenos Aires yielded consumption-related welfare gains.[14] In the short term, however, the change can result in negative redistributive impacts for people who do not have the option of switching from public transportation to cars. To protect the poorest households, cities could target transfers exclusively to them.

[14] The welfare definition used includes only consumption of housing space and other goods; it excludes distributional impacts or externalities, such as access of low-income groups to economic opportunities.

Cash transfers are more efficient than in-kind benefits, but they can be difficult to implement, for a variety of reasons, including the undercoverage of the chronically poor and the difficulties associated with verifying compliance with conditionalities and introducing graduated benefit structures (Ibarrarán et al. 2017). Assessment of the distributional impacts of transportation policies and constraints affecting the implementation of cash transfers is therefore crucial for ensuring that low-income groups benefit.

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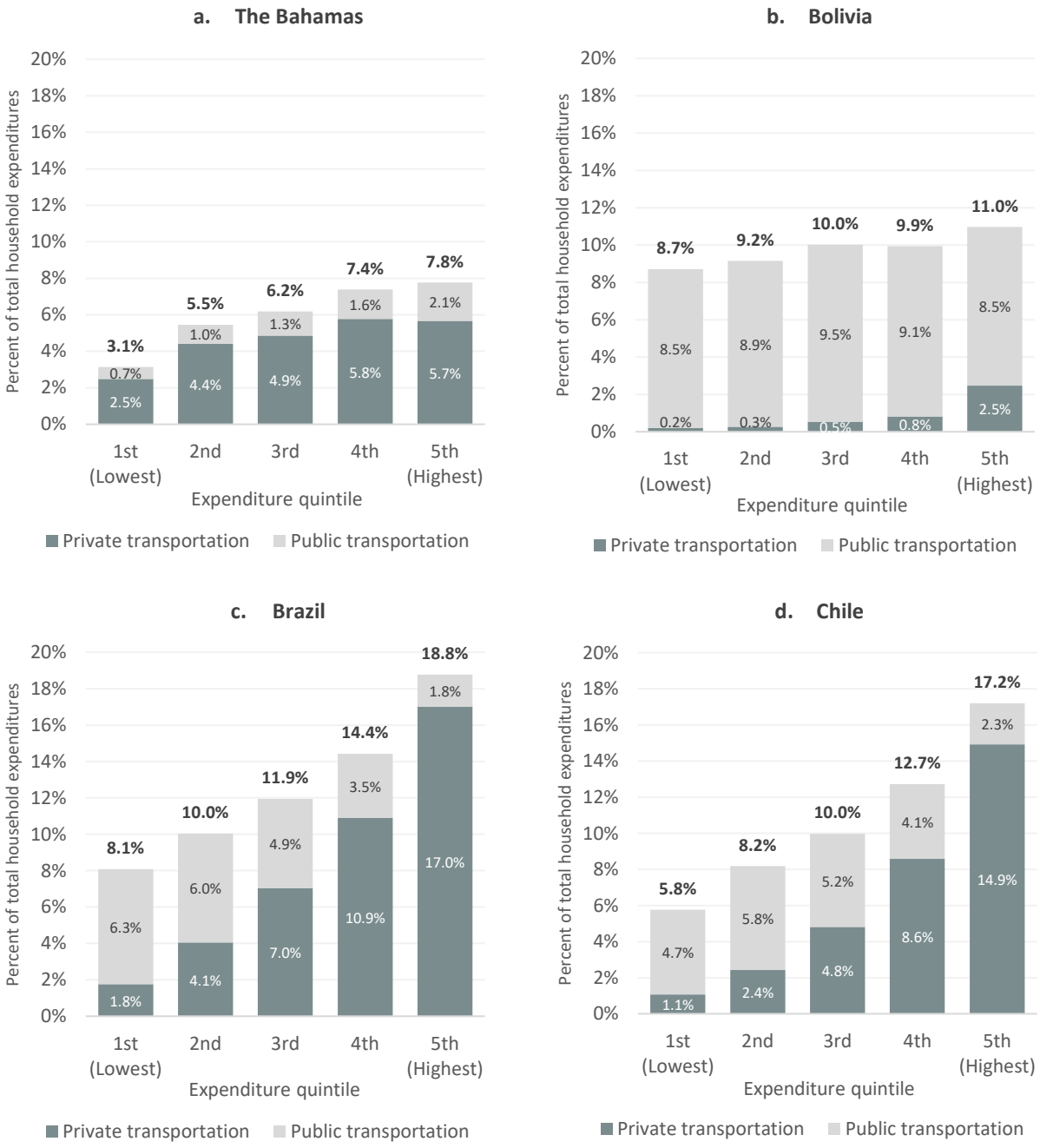
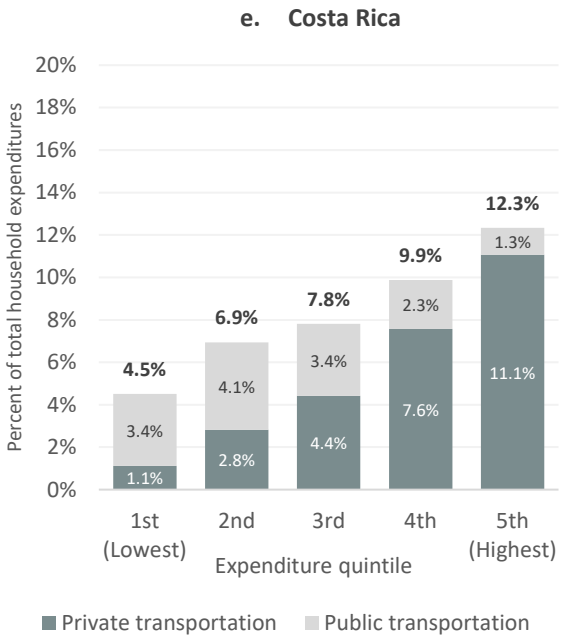
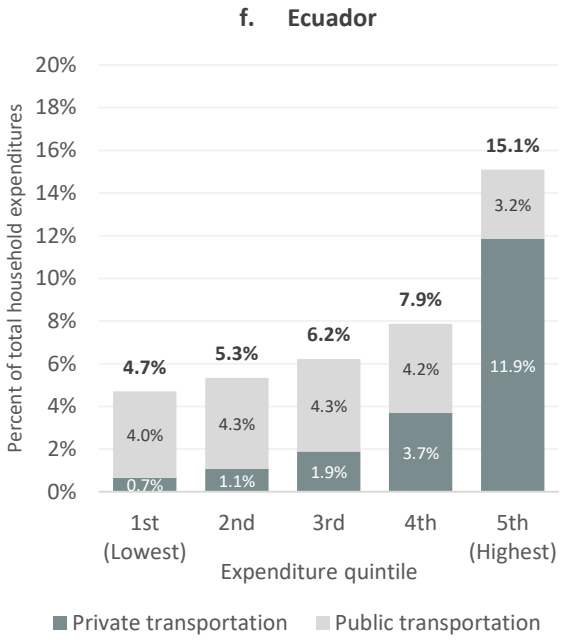
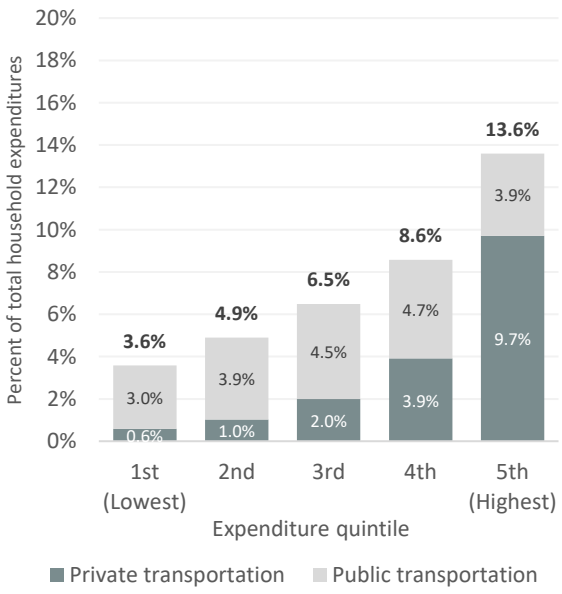
Appendix

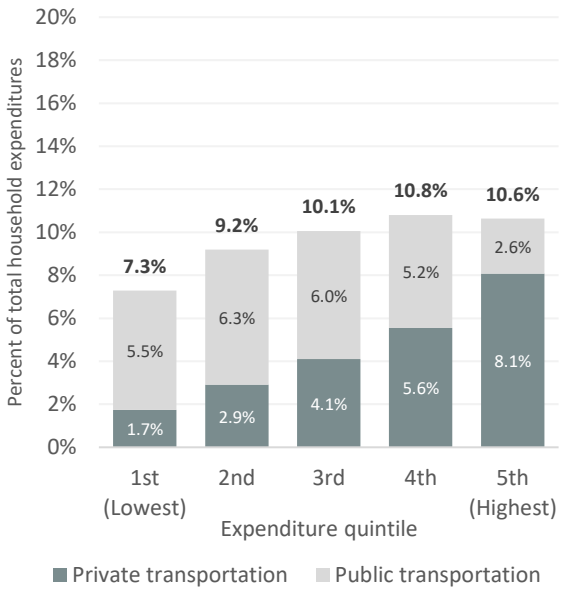
Figure A.1. Transportation expenses as percent of total household expenses in selected countries in Latin America and the Caribbean, by expenditure quintile, 2014



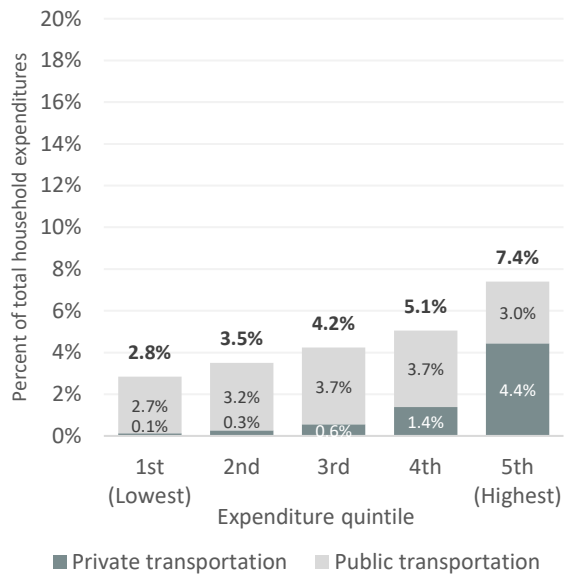

e. Costa Rica
Percent of total household expenditures
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
4.5%
6.9%
7.8%
9.9%
12.3%
3.4%
4.1%
3.4%
2.3%
1.3%
1.1%
2.8%
4.4%
7.6%
11.1%
1st (Lowest)
2nd
3rd
4th
5th (Highest)
Expenditure quintile
Private transportation
Public transportation


f. Ecuador
Percent of total household expenditures
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
4.7%
5.3%
6.2%
7.9%
15.1%
4.0%
4.3%
4.3%
4.2%
3.2%
0.7%
1.1%
1.9%
3.7%
11.9%
1st (Lowest)
2nd
3rd
4th
5th (Highest)
Expenditure quintile
Private transportation
Public transportation

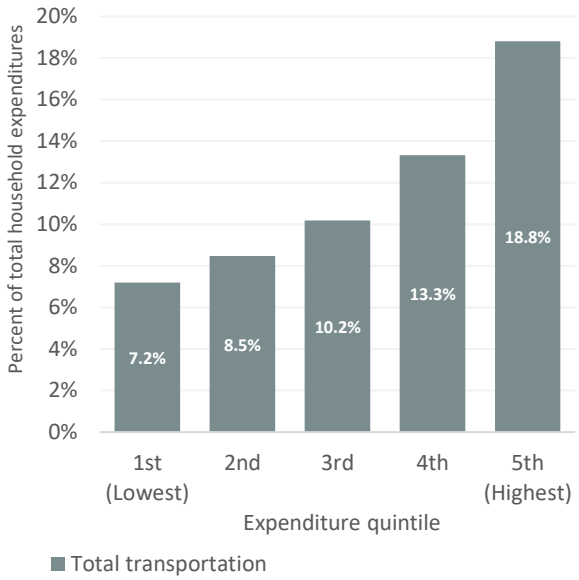

g. Honduras
Percent of total household expenditures
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
3.6%
4.9%
6.5%
8.6%
13.6%
3.0%
3.9%
4.5%
4.7%
3.9%
0.6%
1.0%
2.0%
3.9%
9.7%
1st (Lowest)
2nd
3rd
4th
5th (Highest)
Expenditure quintile
Private transportation
Public transportation


h. Mexico
Percent of total household expenditures
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
7.3%
9.2%
10.1%
10.8%
10.6%
5.5%
6.3%
6.0%
5.2%
2.6%
1.7%
2.9%
4.1%
5.6%
8.1%
1st (Lowest)
2nd
3rd
4th
5th (Highest)
Expenditure quintile
Private transportation
Public transportation

i. Nicaragua

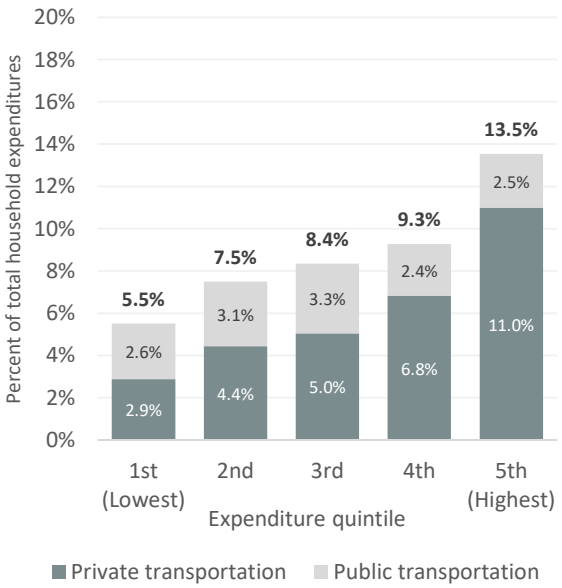


j. Panama*

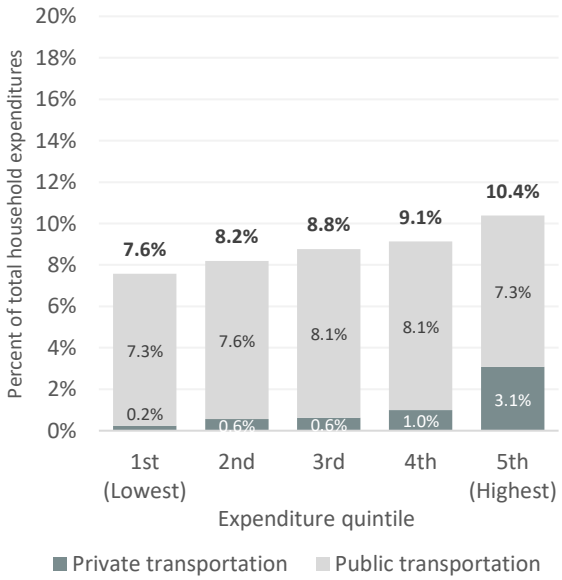


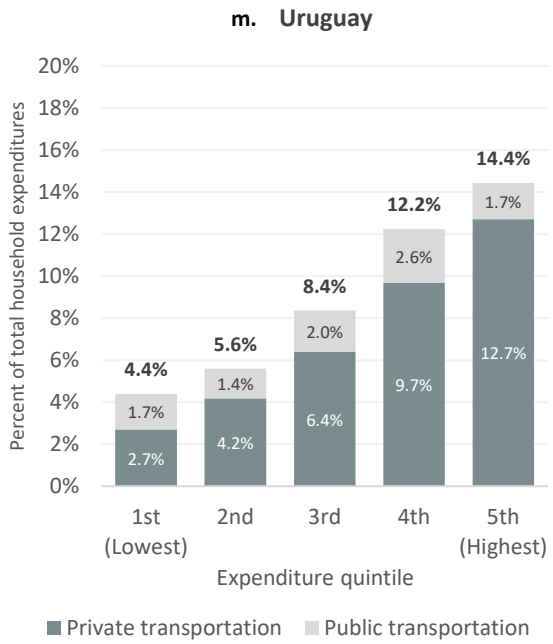
* Breakdown between by public and private transportation is not available.

k. Paraguay



l. Peru





Source: Authors' elaboration based on Gandelman, Serebrisky, and Suárez-Alemán (2018).

Table A.1. Public bus fares in selected cities in Latin America and the Caribbean

City	Single fare for 12-kilometer ride, in local currency, August 2018	Description
Asuncion, Paraguay	₲2,200	Basic rate for conventional service
Brasilia, Brazil	R$3.5	Representative bus fare
La Paz, Bolivia	Bs 2.2	Average minibus fare
Lima, Peru	S/. 1.5	Representative bus fare
Managua, Nicaragua	C$2.5	Basic bus fare
Mexico City, Mexico	$7.0	Autobus fare for ride of more than five kilometers
Montevideo, Uruguay	Ur$29	Basic rate for a one-hour bus ride
Nassau, The Bahamas	$ 1.25	Basic rate for jitney buses
Panama City, Panama	B1.25	Fare of Mibus and other buses
San Jose, Costa Rica	C 291	Average of bus fares for routes of less than 10 kilometers
Santiago, Chile	Ch760	Peak-hour rate for bus, metro, and/or metro-rail
Tegucigalpa, Honduras	L 6	Basic rate for traditional bus

Source: Authors' elaboration based on data collected from governments and operators and contacts of Inter-American Development Bank Country Offices.