CONTESTED NICHE-INNOVATIONS IN TRANSPORT: EXPERIENCES FROM THE *INTER-COMUNAL* BICYCLE SHARING SYSTEM IN SANTIAGO, CHILE 2011-2017

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Veronica Luisa Saud Casanova

The Bartlett Development Planning Unit
UCL
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I, Veronica Luisa Saud Casanova, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

VERONICA LUISA SAUD CASANOVA

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Abstract

Significant new technological developments in transport are already part of our urban landscape, helped by trends in the globalisation of economic activities. Acknowledging that technology is a facilitator of key changes in urban mobility, this thesis examines the institutional context in which a new transport technology is deployed, highlighting concerns not only about possible failures of an 'enabling state', but also about the 'enabling environment' as a central policy issue. This perspective provides a suitable space to further discuss the increasing governance hybridity in deploying new technologies in transport, acknowledging that the balance of power appears to be shifting.

This research seeks to analyse the role of decision-making processes in triggering transformative adaptations that account for a mobility justice transition towards more equitable and inclusive mobility landscapes. Empirically, the thesis presents a case study promoting utility cycling via the deployment of an inter-*comuna*l Bicycle Sharing Scheme, comprising 14 *comunas* in Santiago, Chile's capital city, a fragmented metropolitan area with high socio-spatial inequalities. This research approach combines quantitative and qualitative methods of data gathering and analysis. A survey of 343 current bike-hire users at the busiest stations in order to gauge the perceived benefits of such deployment was complemented by interviews with key decision-makers and direct observations of operational logistics in the field. Business model innovation and public tendering processes provided valuable insights into the decision-making process as a subject of analysis.

Findings suggest that a mobility justice transition is a relational matter. Indeed, inter-governmental agreements and collaborative actions were crucial in challenging patterns of socio-spatial inequality and proved to be a transformative strategy for change. However, prospects for a radical transition towards greater mobility justice are mixed. In conclusion, partnerships supporting niche-innovations operate within norms, values and practices, which are socially and culturally conditioned, and systematically shaped by the actions of society. Unfolding this rationale and 'working through' tensions and synergies towards the search for a common interest on the basis of transparency, collaboration, trust and deliberation, there is potential for setting out a mobility justice transition pathway.

Impact Statement

This thesis seeks to create an impact upon the current knowledge on technological deployments in transport and mobility justice, as a relational matter, approached from the distributive dimension of the deployment of the first inter-*comunal* Bicycle Sharing System in Santiago, Chile. Through an analysis of decision-making processes, this thesis led to question how transport needs are considered and addressed, as the goal of development planning is, undoubtedly, citizenships.

Thus, this thesis makes three contributions to contemporary urban transport and development debates to help planners and decision-makers in building more equitable and inclusive transport landscapes, considering a highly unequal city such as Santiago, highlighting the social challenges and moments of change that Chile is currently facing.

First, I argue that to trigger a mobility justice transition, it is not only a matter of involving as many actors as possible in the deployment of technological niches to address social needs. It is also a challenge to understand the processes of designing and implementing collaborative strategies between institutions, organisations and civil society, as well as ensuring that cohesion and collaboration are sustained over time to trigger the process of change that the discourses in technology deployments aim to address. Furthermore, collaboration is indeed a sign of change towards a mobility justice transition; however, it requires an analysis of how and who are recognised as key partners and what characteristics are relevant to design robust associativity strategies that allow working in the pursuit of common interests over time.

Thus, one of the main impacts that this thesis makes relates to the study of processes of change towards a mobility justice transition, where undoubtedly, the priority must be placed on positioning public values as a social agreement. Therefore, this first impact relates to the theoretical and analytical perspective here developed, contributing with a retrospective analysis of decision-making processes to the academic discourse. Second, this novel way of analysing transitions also relates to a planning policy scope, as it allows to measure and assess the social impacts that technological deployments are having during their trajectory. Thus, they can address the distributional aspects of a technological deployment in practice. Third, this thesis makes an explicit impact on the governance

level, helping institutions, organisations, and civil society by providing a simplified understanding of a transition as a complex and non-linear process, illustrated by the multidirectional relationship in decision-making, both horizontal (the sub-national level) and vertical (the transnational level) when pursuing common goals, as BikeSantiago showed in its process of deployment via applying the Multi-Level Perspective.

This perspective can also help the different levels of governance to balance and anticipate potential failures and damages that technological deployments can generate. On many occasions, these unforeseen events are not well addressed, since as I could observe, the primacy of the economic-private values displaces the public ones. Therefore, this thesis argues that the rationality to trigger changes should be aimed at citizenship in every aspect of the decision-making process.

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Acronyms & abbreviations

B-Cycle LATAM SpA	Service operator, BSS BikeSantiago
B-Cycle LLc	Manufacturer, BSS BikeSantiago
BSS	Bicycle Sharing Schemes
CRS	Corporate Social Responsibility
CSSP	Cross-Sector Social Partnerships
DBOMF	Design, Build, Operate, Maintenance and Finance Contract
DBOM	Contract Design, Build, Operate and Maintenance Contract
GIFE	Group of Institutions, Foundations and Enterprises
ICT	Information and Communication Technologies
IRR	Internal Rate of Return
Itaú Unibanco Holding S.A.	Financial investor, BSS BikeSantiago
KPIs	Key Performance Indicators
LM	Linear Metres
MLP	Multi-Level Perspective
NIE	New Institutional Economics
NIS	National Investment System
NPG	National Public Goods
NPV	Net Present Value

MTU	Monthly Tax Unit
OECD	Organisation for Economic Co-operation and Development
PNUD	Naciones Unidas para el Desarrollo
PM	Peak Morning
QALYs	Quality Adjusted Life-Years
QCA	Qualitative Content Analysis
SCOT	Sociology of Technology
SECTRA	Transport Planning Secretariat, Chile
SNM	Strategic Niche Management
SPI	Social Priority Index
SSGI	Social Stratification and Government Inequality
STS	Science and Technology Studies
STT	Socio-Technical Transition
TCE	Transaction Cost Economics
TIS	Technological Innovation Systems
TM	Transition Management
TS	Transition Studies

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Chapter 1 Overview of thesis

1.1 Social and institutional challenges in emerging mobilities deployments

In the last decade, significant technological innovations have been consolidating the urban transport landscape, helped by trends both in the globalisation of economic activities and in advances in Information and Communication Technologies (ICT), while there have been significant societal and environmental issues worldwide. Acknowledging that technology has been recognised as a facilitator in facing key urban and environmental challenges (Grunwald, 2016), this phenomenon has involved deploying various types of technological transport schemes. Ranging from personal shared schemes in transport (e.g, the case of the Bicycle Sharing Systems BSS as one of the most consolidated schemes), to movement systems (e.g. Autonomous Vehicles and Shared Autonomous Vehicles), and integrated platforms services (MaaS), a new urban transport landscape has rapidly emerged in recent years. Indeed, Bicycle Sharing Schemes (BSS) have proved to be promising components of urban transport worldwide regarding significant advantages in addressing societal and environmental concerns by increasing active travel (Fishman, 2016; Link et al., 2020; Nikitas, 2019, among others).

Hence, many cities around the world have launched such novel mobility schemes, giving rise to the emergence of cycling as a new culture of mobility in recent decades in response to the consequences of the dominant car mobility regime (Geels, 2012). Due to the high diffusion and stabilisation of such systems, BSS are considered in the transition literature as niche-innovations in transport (O' Tauma, 2015; Geels, 2019), under the understanding that a niche-innovation is an alignment between multiple actors, a novel technology and the creation of supporting measures for its deployment (Geels, 2012), on the basis that technology is a social construction (Bijker, 1995).

Contemporary guidelines acknowledge the uptake of emerging schemes (ITF, 2020; POLIS, 2019). However, several fundamental challenges identified during the early days of BSS are still to be addressed (Fishman et al., 2012; Saud and Thomopoulos, 2021). The diverse geographies, urban contexts and institutional settings where such BSS operates have exacerbated those challenges. Moreover, the lack of consistent and coherent collaborative strategies between different key partners, organisations,

institutions and civil society to sustain collaboration over time in terms of their design, tendering, operation and expansion of such systems has significant social and institutional implications. The urban transport features of BSS include a melting pot of diverse social policy, governance and organisational objectives, ranging from business model innovation, public procurement and tendering, logistic strategies as well as the perceptions of its benefits and disadvantages. However, the increasing governance hybridity in such technological deployments introduces concerns not only regarding the failures of an ‘enabling state’, but also on the ‘enabling environment’ to deploy such systems in terms of hybrid forms of allocating and leveraging resources.

Therefore, approaches aimed at understanding the decision processes that can trigger collaboration, as well as the key elements that can support better alignment between different actors and institutions, are key to discussing the relevance of these systems in addressing the real social and institutional challenges faced by these schemes, and thus triggering processes of change. The role of decision-making instruments, including viable business models and branding practices that rely on sponsorship and advertising in practice, are analysed in the present research.

Current operational challenges in the BSS literature include fleet management, maintenance, payment, vandalism and customer service satisfaction (Crutchley and Kubitz, 2019; Nikitas, 2019), but above all, issues of inequality and social inclusivity in their deployment processes underline the need for more collaborative and deliberative decision-making processes (Saud and Thomopoulos, 2021). Through the lens of mobility justice, this thesis argues that such practices should be aligned with broader societal goals, such as improving accessibility and equality for all socio-economic groups, in order to avoid discrimination, social or gender exclusion and increase the actual and potential possibility for BSSs and emerging mobilities to maximise people's accessibility to their activities.

Understanding the role of decision-making processes of an emerging mobility deployment in triggering transformative adaptations towards mobility justice transition pathways is crucial for policymakers worldwide. This is especially so in contexts with high levels of socio-economic segregation that reproduce urban inequalities. Linkages between the institutional and operational levels are essential to enable and ensure institutional arenas that allow equal treatment of individuals and institutions. Thus, this

would improve and broaden the perception of the benefits that these schemes potentially bring, reducing the mismatches found between resources, needs and institutional capabilities. In the Global South in particular, where active travel constitutes the majority of urban travel (Rode et al., 2017) and top-down governance approaches are common (Levy, 2015), the lack of holistic theories about emerging mobility deployments is aggravated by their multi-dimensional nature. With a tendency to address these new technological developments as a ready-made solution, with a short-term time horizon, it does not appear that the introduction of these systems would have any significant social impact.

Academic research in mobility justice and socio-technical transition frameworks echoes these concerns. Research in socio-technical transitions has argued that socio-technical systems are materially, socially, and culturally constructed. This theoretical framework aims to understand and address significant transformation processes by conducting retrospective and interventionist analyses. Thus, changes from established socio-technical production and consumption systems to new and radical ones are analysed based on co-evolutionary social and technological change. However, multiple critiques about this perspective hinge on three crucial dimensions regarding its rationale (Geels, 2019:1) 1) “spatial and geographic concerns, 2) the provisioning dimension, 3) power relations”, disregarding the distributional aspects of a niche deployment.

This thesis attempts to address the distributional concerns in the deployment process of the BSS in Santiago through the lens of the mobility justice framework. To this purpose, this thesis emphasises that the achievement of mobility justice is through processes in which inequalities and patterns of urban segregation can be addressed and challenged. In particular, it investigates an initial transition pathway referred to the existence of transformative adaptations and/or adaptive strategies that could trigger a process of change (Patterson et al., 2017) towards more equal and inclusive mobility landscapes.

One starting point for research on mobility justice transitions is through an institutional approach, considering institutions as the ‘rules of the game’ (Canitez, 2019). Thus, the New Institutional Economics (NIE) framework allows placing the focus on the ‘enabling environment’ to deploy a BSS as a niche-innovation in transport. This is about understanding the instance of support comprised of sectoral investment and financial strategies, formal markets, a specific regulatory (or de-regulatory framework), tax

management, and institutional and organisational capabilities and practices (Carroll, 2012). This institutional perspective is relevant to answering the research question as it gives space to better discuss the increasing governance hybridity in such technological deployments. However, this perspective assumes that the balance of power seems to be shifting from the state responsibility as a political matter to a 'voluntary' will of private firms and global corporates (Docherty et al., 2018), as the case study in Santiago shows.

1.2 Research question, aim and sub-aims

This thesis addresses the following research question: How might a niche-innovation in transport lead to a mobility justice transition, considering a case study of the first inter-*comunal* BSS in Santiago, Chile, in 2011-2017?

This thesis seeks to analyse the role of decision-making processes in triggering transformative adaptations that account for a mobility justice transition towards more equitable and inclusive mobility landscapes, considering the case of the first inter-*comunal* BSS in Santiago. Three key sub-aims help build an answer to the question:

i) To understand the institutional rationale behind the BSS regional business model as a planning tool to deploy the first inter-*comunal* BSS in Santiago in order to analyse its role in triggering a mobility justice transition.

ii) To provide linkages between institutional and operational levels when deploying the BSS in Santiago, highlighting the role of the inter-governmental agreement in fostering or hindering the reproduction of inequalities.

iii) To analyse the performance of BSS BikeSantiago considering the first year of its full operation in the 14 *comunas* in order to understand the relationships between planning tools, agreements made, and the operational level in both fostering or hindering more equal and inclusive mobility landscapes.

By analysing the different stages of decision-making at both institutional and operational levels, the focus is placed on public policies and technical instruments, individuals, institutions and organisations comprised in the process of the BSS deployment in Santiago scheme. This scheme aimed to promote utility cycling in Santiago as a way to include the bicycle as a formal means of transport in a city with high car dependency and

long distances and travel times faced by the majority of the population. In addition, Chile has the highest levels of inequality within the OECD group of countries (2018), concentrating wealth, infrastructure and technological advances in transport in a few of the wealthiest areas of the city (Chapter 4 and 5). Due to these socio-spatial conditions, in conjunction with a particular sub-national governance setting consisting of *comunas* as semi-autonomous local decision-making units and a weak regional governance capacity, Santiago is an ideal Global South case study for a socio-technical transition research, considering the case of the first inter-*comunal* BSS in Santiago.

To answer the research question, this thesis considers process-based research and decision-making as the study subject (Chapter 2). Moreover, here the existence of a twofold institutional rationale underlying decision-making in Santiago is argued. The first acknowledges the existence of a rationale that leads to restricting, reducing or depriving the capability of related institutions to actively intervene in the BSS deployment process. The second also recognises the existence of collaborative practices in an attempt to challenge socio-spatial inequalities. However, in the absence of an explicit mobility justice agenda consistently supporting collaboration over time, in conjunction with a particular institutional capability in decision-making, these all together pose a scenario in Santiago where a permanent association between the key partners is not encouraged. Therefore, triggering a mobility justice transition process is likely to involve a move away from current patterns of decision-making processes towards a framework based on the principles of equality and inclusiveness in decision-making based on collaboration and deliberation. In this sense, this thesis seeks a more reflexive governance approach to analyse collaborative patterns in an attempt to challenge urban inequalities towards more equal and inclusive mobility landscapes.

To address the research question, this thesis works with the 'Multi-Level Perspective' (MLP), a theoretical and conceptual framework derived from Transition Studies (TS) (Chapter 3). This framework is considered here as a conceptual map for tracing and narrating past and recent transitions, providing an expanded understanding of the action context regarding a particular transition process. As a process theory, the MLP is framed by a 'constructivist' narrative (Hard, 2001), derived from its theoretical roots: New Institutional Economics (NIE), Evolutionary Economics and Sociology of Technology. Therefore, MLP comprises the following stages as a narrative to analyse a process of deployment (Geels, 2019): (a) niche-innovations develop an internal momentum allowing

them to upscale, (b) niche-innovations, ‘momentum’ and landscape changes together generate pressures on the current system and regimes, and (c) current regimes are destabilised, opening a window of opportunity for niche-innovations to upscale and disrupt the existing systems.

1.3 A mobility justice transition research

In addressing the distributive concerns in the deployment of the BSS in Santiago, this thesis complements the Multi-Level Perspective with the mobility justice framework, in the understanding of ‘mobility regimes’, discussing the way by which movements of people in space are controlled so that eventually they can become an unequal stable pattern, as an expression of beliefs, practices and traditions (Rhodes, 2007; Kesselring and Volg, 2013). This conceptualisation allows a further discussion not only regarding the physical equipment and location of a niche-innovation such as a BSS, but also the dynamic process by which different institutions are creating, enabling, but also ensuring - or not - the conditions to improve or change the movement of people (Docherty et. al., 2018). This institutional approach posed here involves understanding who and how key partners are recognised and embedded in a particular partnership design (Hrelja et al., 2018) (or alliances between the public sector, private sector, NGO, civil society), as a hybrid type of governance (Dávila and Brand, 2012). However, the discussion about the social dimensions of emerging technologies in mobility deployments and the alliances that sustain them has been rarely addressed (Sheller, 2012; 2018).

To enable a transition from the sphere of mobility justice, the distributional dimensions in a niche-deployment are approached here as “the ‘why’ (the public policy function), the ‘what’ (the rules of the game), the ‘who’ (the networks of actors and their position, power and objectives [as well as who benefits from social welfare]) and the ‘how’ (the way in which the public is involved and how accountability and transparency are maintained [and how it is received])” (Docherty et al., 2018:117-118). Moreover, the notion of ‘equality’ relates to the assumption that people should be ‘treated as equals’ as a high-level priority in mobility (Dworkin, 1977:68; Mullen et al., 2014). As such, it implies a particular approach to people’s differing needs, under the assumption that each person matters (Mullen et al., 2014). The latter authors have identified two high-level priorities in transport planning to launch the debate: i) reducing transport-related deaths to a minimum,

recognising the right to equal safety and ii) recognising the right of people to have access to some form of effective means of transport.

Discussing the launch of a BSS through these premises poses significant challenges in relation to institutional capabilities in recognising key partners and, therefore the way in which a partnership is designed and built. This may affect how the social dimensions of mobility systems are addressed in many ways, including unfair and discriminatory stratification processes, which may reproduce and deepen socio-spatial inequalities (Ostrom, 1983).

1.4 A mobility justice transition addressed through an institutional perspective

As one of the crucial components of the transition literature, the New Institutional Economics (NIE) framework is applied in this research to provide an analytical framework for a mobility justice transition research, approached from governance, institutional and organisational perspective. NIE offers a framework to analyse decision-making processes, focusing on the links between the institutional and operational levels of the BSS in Santiago as in its deployment process. The NIE framework also enables an understanding of the role played by instruments in planning, agreements and fleet management (Rietveld and Stough, 2005), under an understanding of the institutional level as a set of rules, norms, beliefs, practices, or the 'rules of the game' that together shape interests and motivations comprised in a particular 'enabling environment' (North,1990; Ostrom, 2007; Carroll, 2012). This perspective provides a suitable space to discuss further the increasing hybrid governance of the new technological niches in transport while acknowledging that the balance of power seems to be shifting. This thesis assumes that some sectors of the economy and global corporates dominate technological and industrial deployments (Docherty et al., 2018), leading to inequality, poverty, and environmental concerns. Authors such as Hockett and Omarova (2018) have argued that the inherent dilemma between market or government leaves an unaddressed zone with respect to the provision and distribution of novel services. In this regard, Docherty et al. (2018) refer to this dilemma, arguing an asymmetric relationship between global corporations and individuals. In this regard, Eaton (2020) notes the preference of trans-national over sub-national levels for the introduction of initiatives, such as a BSS, due to their degree of autonomy from national levels.

Therefore, this thesis addresses these concerns from an institutional and organisational point of view, developing an understanding of the construction of an 'enabling environment' when implementing the BSS in Santiago, and providing insight into the conditions under which the deployment process could lead to a mobility justice transition. In doing so, this thesis selected several analytical perspectives comprised in the NIE literature to draw a 'big picture' (Geels, 2012; Menard, 1995). In this regard, Transaction Cost Economics (TCE), here addressed through the lens of business model innovation, contracting to enable collaboration (Hrelja et al., 2018), polycentricity and debates about the metropolitan organisation are discussed through the lens of the social stratification and government inequality thesis (Ostrom, 1983). This contextualises the socio-spatial inequalities in Santiago, providing a context to discuss the sub-national levels as units of analysis.

The analytical perspective developed in this research combines these three 'approaches'. Firstly, TCE provides a relevant approach to the transactions between public transport operators and authorities (Canitez, 2019), such as within the BSS in Santiago. However, and in line with the sub-research i), this thesis does not attempt to analyse the efficiency of transactions typically associated with TCE research (Williamson, 1991; 1997; 1998), but rather seeks to analyse the rationale and context in which a potential transaction takes place, considering a business model as a planning tool to deploy the BSS. This is so that prior information in decision-making could take a hybrid form when creating an 'enabling environment' as in the present case study, where public information related to feasibility studies also refers to business models as a tool of planning to guide future transactions. In addition, a BSS has been argued as a niche-innovation in transport due to its novel business model (Geels, 2019). Therefore, a business model innovation framework is adequate to address the sub-objective i). Here, the focus is placed on the assumptions made about private and public values and the role of these elements in a potential transaction, representing a tool to organise initial decision-making scenarios between the regulative, normative, and cultural-cognitive actors contained in its key assumptions (Geels, 2004; Raven et al., 2017).

Secondly, debates about the metropolitan organisation are discussed through the lens of the social stratification and government inequality thesis (Ostrom, 1983) as an institutional matter to contextualise the socio-spatial inequalities in Santiago. This is framed within the notion of polycentricity in reference to *comunas* as the basic units of

decision-making through the notion of ‘semi-autonomous decision-making’ (Oakerson and Parks, 2011). This highlights self-organised practices that reproduce socio-spatial inequalities as well as institutional capabilities aligning common interests through inter-governmental patterns of collaboration to face them.

Thirdly, contractual forms to create an ‘enabling environment’ to deploy the BSS in Santiago introduce significant institutional challenges, particularly regarding the alignment between the key partners to achieve common goals as well as ‘self-interested’ issues. The relevance of collaborative agreements as processes that trigger changes in the case study is highlighted, supported by a more relational approach to discussing contracts related to ‘enabling environments’ (Carroll, 20212). Thus, it explores relational issues to address trust-building processes as a relational issue in transport partnership design (Hrelja et al., 2018). Moreover, collaboration within an ‘enabling environment’ is subject to motivational and informational problems.

Seeking to provide insights for a mobility justice transition, this research examines how different institutional practices and agreements were managed to deploy a unified system in Santiago. This research considers that the sub-national levels in Santiago are comprised of a group of semi-autonomous decision-making units of decision-making, however, with different capabilities to leverage resources (see Chapter 4, the Social Stratification and Government Inequality SSGI thesis). Considering these institutional characteristics in Santiago, as well as the external influences of the industry on BSS, corporate sustainability and philanthropic practices nurtured the niche-deploying as a ‘mobility cause’. In this regard, corporate sustainability literature in philanthropic practices is discussed in Chapter 4 and 7, posing significant institutional challenges in pursuing social and environmental goals, as can be perceived in the analysis of this case study.

Finally, to develop a transition research addressing the gap in mobility justice regarding the distributional aspects of the BSS, the negative side effects of any niche-innovation deployment, especially during the first phases of the deployment, are crucial in this discussion. This thesis argues that these negative effects, or dis-benefits, are not only a matter of a premature technology itself but also an institutional duty to address public values (Docherty et al., 2018) (see Chapter 4). However, such negative effects could become permanent as a consequence of a particular institutional capability and rationale

unable to address these public values. Hence, this is what this thesis calls a ‘contested’ niche-innovation.

Thus, this thesis focuses on an early stage of a deployment of a niche-innovation, analysing the role of the institutional decision-making processes in triggering transformative institutional strategies and their links with the perception of benefits, in order to outline the transition pathway that helps answer the research question. Connectedly, socio-spatial inequality patterns are crucial conceptualisations in this research focus as a relational and capability matter between the different institutional levels. From the institutional and organizational side, a paradox perspective on corporate sustainability framework (Hahn et al., 2018) helps to understand the relationship between the institutional and operational levels. This gives rise to contradictions, tensions, and simultaneous synergies that characterise competing social and environmental needs and corporate profitability.

Why is a Bicycle Sharing System a niche-innovation in transport?

As mentioned earlier, new types of urban transport services have emerged during recent decades under the rationale of ‘shared mobility’. Bicycle Sharing Schemes (BSS) have shown to be promising components of urban transport worldwide, considering their significant advantages in addressing societal and environmental concerns by increasing active travel (Fishman, 2016; Link et al., 2020; Nikitas, 2019, among others). Hence, many cities worldwide have launched such novel mobility schemes, positioning a BSS as part of an urban mobility transition and effectively contributing to incorporating cycling as a transport alternative within the formal transport service. Thus, this new culture of mobility has emerged in recent decades to challenge the dominant car mobility regime (Sheller, 2012; Geels, 2012). However, despite contemporary guidelines acknowledging the uptake of emerging schemes (ITF, 2020; POLIS, 2019), several key institutional and social challenges identified during the early days of BSS are still to be addressed (Fishman et al., 2012; Saud and Thomopoulos, 2021), which is a matter of the present research.

In analysing the origin of this niche-deployment, the promotion of cycling appears as breaking away from the dominant automobile regime (Geels, 2012) as well as helping support the poor transport system developments in a large Latin American city such as Santiago. However, a relatively elitist pattern could be perceived in Santiago due to the

high socio-spatial inequalities that characterise the city. This is addressed by illustrating a strong concentration of cycling facilities, both equipment and infrastructure, in a few wealthier *comunas,* in line with the Social Stratification and Government Inequality SSGI thesis (Chapter 4 and 5). Based on this fact, the implementation of the BSS system takes on relevance, as it manifests an experimental action to challenge the tendency to concentrate access and public investment in wealthy *comunas.*

1.5 Experiences in decision-making: the inter-*comunal* Bicycle Sharing System in Santiago

The first inter-*comunal* Bicycle Sharing System in Santiago, Chile's capital city, is chosen as an example of transition-related research. The governance and institutional structure, which includes two sub-national administrative levels, the local and regional levels, is highlighted to analyse sub-national practices in urban transport planning and management and the subsequent social outcomes in terms of perceived benefits and dis-benefits. Focusing on the decision-making mechanisms, it discusses the mix of public and private institutional settings that led to and shaped the first inter-*comunal* BSS in Santiago. This discussion contemplates the Chilean sub-national governance system, where the local level or *comunas* constitute the basic territorial unit of the state administration and the regional government manages the regional territory comprised within its jurisdiction. Considering sub-national research, in which *comuna* councils are in charge of land use regulation and public goods administration to generate local revenue – here discussed as semi-autonomous decision-making units (further details in Chapter 4), the regional level coordinates these multiple local levels. However, its participation in local decision-making remains unclear due to its weak capabilities (Eaton, 2004; Saud, 2014). Through this case study, various planning tools are illustrated, discussed and analysed (e.g. business model, public procurement, voting sessions), disclosing assumptions and argumentations regarding the construction of public and private values and practices in decision-making (see Chapter 4).

As mentioned before, the first inter-*comunal* BSS in Santiago between the period 2011 to 2017 – the scheme implemented as BikeSantiago in 2013 - offers an appropriate case to apply the Multi-Level Perspective with a particular focus on mobility justice. The niche level illustrates a strategic partnership design to collaboratively achieve a unified system

in 14 *comunas* in Santiago, in response to a self-organised municipal practice tending to reproduce patterns of socio-spatial inequalities and segregation in Santiago (Chapter 6 and 7). The collaborative and self-organised practices are performed through different public tendering types that took place. Therefore, the landscape level shows the various institutional arrangements and efforts to implement a system in 14 different *comunas* in the Santiago Metropolitan Region. However, and from a mobility justice perspective, the different decision-making capabilities comprised in the tendering patchwork posed at the same time, significant institutional and social challenges when looking at how the agreements were made and worked in practice. Moreover, this decision-making process had a significant impact on users' perception of the benefits under such conditions agreed and the real capabilities to achieve them. Therefore, this thesis also seeks to offer policy lessons as to the social role of technology and mobility by demonstrating how social inequality shapes and is shaped by different institutional and organisational practices.

It is worth mentioning that this research is built upon my personal work experience as an investment analyst in Santiago Metropolitan Regional Government between 2011 and 2015. This experience helped me to systematise more effectively different decision-making scenarios promoting cycling utility through the BSS deployment and public investment assessments and management in the bike–lane. Indeed, I was responsible for coordinating different policies and public investment to encourage cycling as a means of transport, a position that allowed me to be familiar with the different public sources of decision-making here analysed (Chapter 6 and 7), helping me with a reflective governance analysis. Thus, this research is the space to reflect on the institutional successes and failures resulting from this particular sub-national rationale in decision-making.

1.6 Overview of chapters

This thesis is structured as follows (See Figures 1.1 and 1.2):

Chapter 1 offers an overview of the thesis in four parts. The introduction, research aim, objectives and research questions are presented first. Second, research gaps are

addressed in this thesis using the theoretical and analytical approaches posed. Third, there is the case study. Fourth, an overview of the chapters is provided.

Chapter 2 outlines the methodology and the research design to best address the research question. The research approach is developed by a mixed-method design, comprising both qualitative and quantitative methods to inform and interpret the object of study as a mobility justice transition research. Regarding the aim of this research, a case study approach is chosen as a research strategy, considering the deployment processes of the first inter-*comunal* BSS in Santiago. Regarding the subject of the present research, decision-making converges in a reflexive governance perspective, allowing a discussion on the institutional and social challenges that this emerging mobility deployment faces. Convergent research design is selected as it best suits the different decision-making processes and planning tools. The core of this research approach is based on collecting and analysing both qualitative and quantitative databases concurrently, integrating the results and then developing a more accurate and detailed understanding of the deployment process of the BSS and the adaptive strategies that could trigger a process of change. To conclude, this chapter informs about the limitations of the research methodology and ethical issues addressed.

Chapter 3 develops a theoretical crossover framework between transition studies and mobility justice, arguing that the achievement of mobility justice is through processes in which inequalities can be addressed and challenged. In doing so, the chapter discusses the selected strand in socio-technical transition research, the Multi-Level Perspective (MLP). It offers a suitable entry point for a retrospective analysis, posing a conceptual 'map' to trace and narrate recent transition processes with key elements for its conceptualisation and analysis. The MLP provides a 'heuristic' combination with the three bodies of theory that underlie it: New Institutional Economics (NIE), Sociology and History of Technology (Bijker et al., 1987;1992) and Evolutionary Economics (Geels, 2004; Fuenfschilling and Truffer, 2014), providing relevant details regarding key assumptions, scope and limitations of MLP. Based on the main critiques of this body of literature, particularly regarding the lack of attention to the distributional aspects of a technological deployment, mobility justice framework helps address these concerns.

The mobility justice perspective first assumes that it is necessary to look beyond the technological deployments as 'artefacts' and ready-made solutions disconnected from

real social challenges as interlinked governance, institutional and organisational concern. In doing so, an approach from mobility justice seeks an integrated vision, combining the institutional dimensions and the distribution spheres under social justice principles. This perspective is supported by an understanding that 'every life matters' and that treating people as equal is not the same as equal treatment. In this regard, the accessibility approach plays a crucial role as a high-level priority under this perspective. This subchapter also complements the accessibility framework with an introductory discussion on equal concerns regarding data management.

Chapter 4 outlines the main analytical framework to develop a mobility justice transition research. The chapter first introduces the relevance of New Institutional Economics in transition studies under three core bodies of literature: firstly, Transaction Cost Economics (TCE), addressed by the business model innovation framework considering it as a planning tool. Three major components comprised in the business model innovation framework are considered to analyse the BSS in Santiago: i) value proposition, ii) value creation, and iii) value capture.

Furthermore, the role of a business model in transition literature is discussed by three key assumptions developed by Bidmon and Knab (2018): i) as an industry recipe, ii) as a mechanism to commercialise technology, and iii) subject to innovation itself.

Secondly, this chapter introduces polycentricity and debates about metropolitan organisation, discussing the Social Stratification and Government Inequality (SSGI) thesis (Ostrom, 1983) to contextualise the socio-spatial inequalities in Santiago. A polycentrism approach sheds light on the relevant attributes for sub-national research, focusing on the notion of semi-autonomous decision-making and the SSGI thesis, helping to create a discussion on the institutional capabilities to tackle socio-spatial segregation.

Thirdly, contracting to enable collaboration is posed in this discussion to illustrate the planning and implementation process of the BSS and properly address its public tendering. Here, the debate focuses on contracts as "less highly specific and more reliant on process," to analyse common objectives (Hrelja et al., 2018:329). This is in order to rethink the partnerships designed in terms of who and how key partners are recognised and embedded in a particular partnership design deploying a transport innovation at the regional scale. In this regard, this sub-chapter highlights the relevance of more relational schemes under such a perspective.

This discussion on contractual matters is followed by the perspective of corporate sustainability and philanthropic practices to address a 'hybrid' governance scenario that the case study shows, particularly considering the current circulation of urban transport policy models between the philanthropy sphere (Montero, 2020). Chapter 4 reflects on social and sustainability concerns and the resulting conflicts from the different institutional and organisational goals of profitability, working on multiple economic, social, and environmental frontlines. This perspective of corporate sustainability allows 'working through' contradictions, tensions and also the simultaneous synergies that characterise competing social and environmental needs and organisational profitability (Hahn et al., 2018). Thus, this positions the research to better reflect the scenarios of an 'enabling state' and 'enabling environments' to accommodate such practices. Chapter 4 concludes with an analytical model for the data analysis chapters, converging and summarising key principles and concepts to be applied in the analytical chapters (Chapter 6,7 and 8).

Chapter 5 contextualises a mobility justice transition research, considering a particular sub-national governance setting, the travel patterns and the distribution of the cycling facilities in Santiago. The institutional specificity regarding the design of the sub-national institutions in the context of decentralization policies is introduced first by explaining the dichotomic process of centralisation in a highly centralist context such as Chile. This is relevant to understand top-down public policies promoting cycling such as the BSS implementation. Socio-spatial inequalities in Santiago are considered from three angles: the Social Priority (SPI) Index, a regional tool to prioritise public investment, an overview of travel patterns and accessibility in Santiago, and the distribution of cycling facilities and characteristics of the cyclist at the time of the BSS deployment.

Chapter 6 analyses the regional business model (or the regional study) as a planning tool, considering the key elements discussed in Chapter 4 regarding the construction of values for potential decision-making scenarios. This analysis seeks to understand the underlying rationale in the early stages of decision making. This analysis considers the definition of business models as "the rationale of how an organisation creates, delivers, and captures value" (Osterwalder and Pigneur, 2010:14), referring in this research to an exchange relationship of economic, environmental and public values between a related group of people and organisations, governance and institutions.

To help answer the research question, this chapter analyses the key arguments comprised in the regional business model to start building a narrative in mobility justice transition. To build this argumentation, this chapter incorporates concerns over assumptions made regarding spatial coverage and the way in which needs are considered, that is, to whom they are addressed and how these measurements are created as a matter of governance. This chapter also presents the public tendering of the BSS to create links between the early stages in decision-making and the next analytical chapter regarding the implementation process.

Chapter 7 provides an understanding of the links between the institutional and operational levels that nurtured an 'enabling environment' to deploy the BSS as a niche-innovation in transport, highlighting the role of the inter-governmental agreements that took place in challenging the reproduction of socio-spatial inequalities. In doing so, this chapter considers the conceptualisation of inter-governmental agreements and self-practices comprised in the BSS deployment, analysing both socio-spatial inequalities leading to segregation and collaboration practice (Chapter 4). This analysis considers the corporate sustainability paradox to address an approach towards change. This analytical approach integrates simultaneous institutional synergies and tensions derived from 'enabling environments' and a given partnership design, assuming increasing hybridity of governance that needs to be discussed from an institutional and organizational perspective to address public values. Furthermore, this chapter considers four qualitative categories of analysis derived from the perspective of corporate sustainability and the paradox in organisations (Chapter 4) (Smith, 2014; Stadtler and Wassenhove, 2016; Standtler, 2018): ii) scheme case of financing a BSS, Private Social Investment (PSI), ii) the emerging patterns (collaboration and segregation), iii) aligned benefits, and iv) experienced tensions.

Chapter 8 comprises two parts. The first part offers an analysis of the BSS BikeSantiago performance considering the first year of its full operation in 14 comunas in Santiago. To provide an understanding of the relationships between planning tools, agreements made and operational levels in both fostering and hindering more equal and inclusive mobility landscapes, this analytical part of the chapter comprises the first analysis of travel patterns, service levels and perceptions of benefits derived from the survey carried out in 2017 to current users. The analysis is followed then by a qualitative approach to current users and to understand their experience with the service in greater depth. The second

part of this chapter (Part II) comprises an integration and discussion of results between the three analytical chapters (Chapter 6, 7 and Chapter 8 Phase I), as further discussed in Chapter 2 regarding the required steps for a convergent research analysis, as it demands a space to reflect on the different decision-making scenarios analysed in triggering a mobility justice transition.

Chapter 9, as the last chapter of this thesis, summarises key findings to answer the research question, recapping the aims and objectives of this research, including assumptions, processes made, and conceptualisations posed. The research makes three types of contributions: theoretical, methodological and empirical. This highlight the theoretical contributions to literature in transition and mobility justice, enabled through the selected elements of the New Institutional Economics framework applied (NIE framework) to address critical social and institutional challenges in the Latin American context. Methodological contributions lie in the mixed-method design and analysis that enabled a comprehensive analysis of the case study.

Finally, limitations of the research are related to the limitations inherent to a single case study. It would be valuable and insightful to contrast several case studies over a longer period of time under this theoretical and analytical approach. However, this thesis contributes with the approach and the necessary elements to be able to adequately conduct future comparative work. This takes into account the complexity of decision-making scenarios in different governance settings as a subject of study and therefore makes its in-depth understanding relevant for a point in comparison, which is intended to be addressed here as future research. Similar to contemporary debates, participatory processes in technological niche deployment require an explicit social justice framework to address issues in participation, collaboration and deliberation, which are also addressed here as future studies with more interventionist analyses in transition studies.

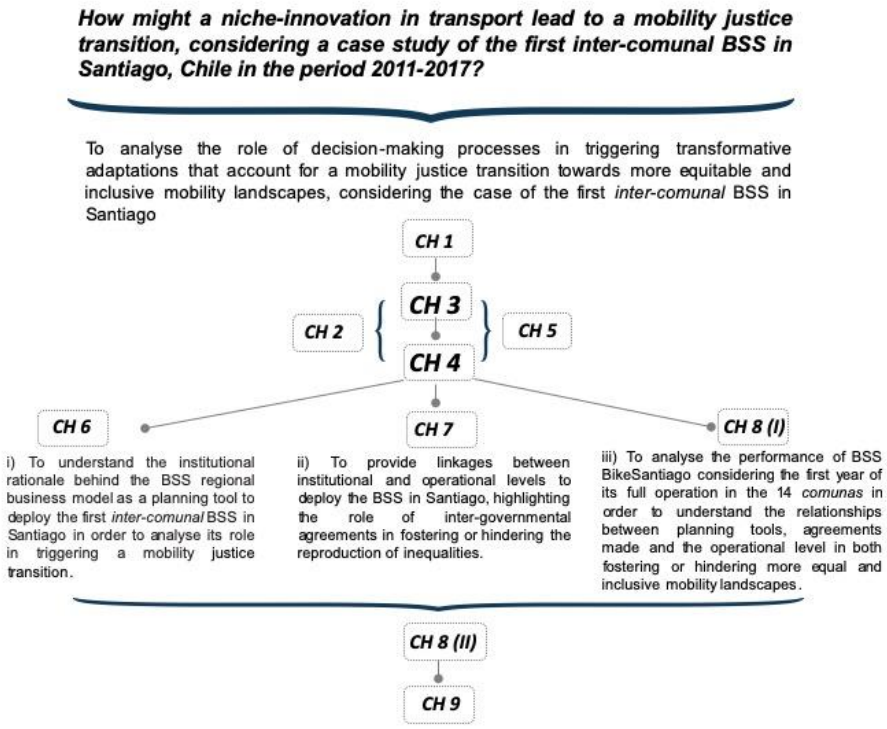

Figure 1.1: Structure of the thesis according to research question, objectives, sub-objectives and chapters (CH). Source: Own elaboration.

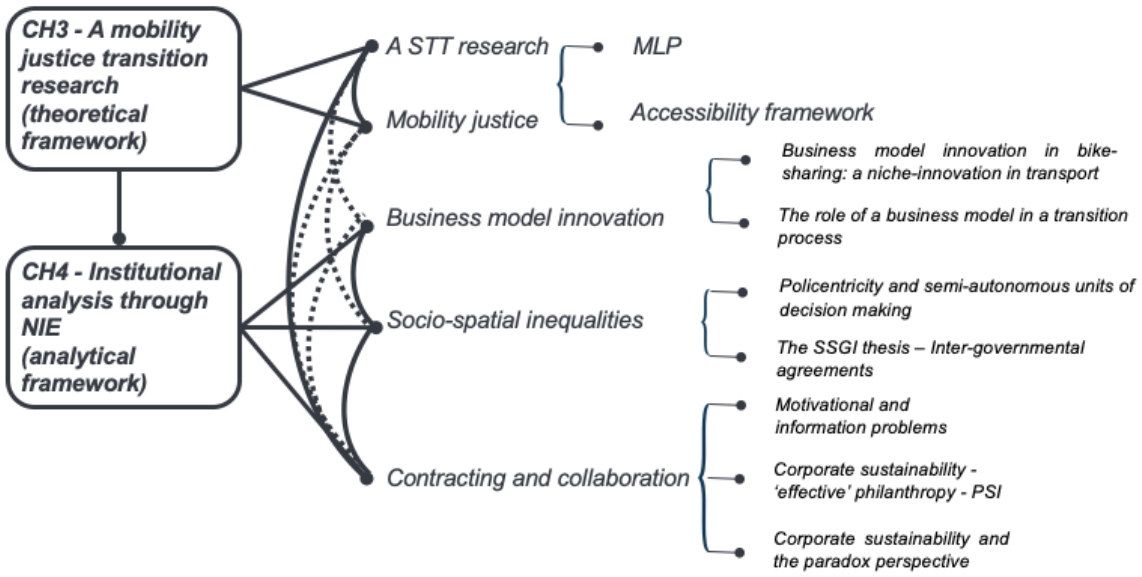

Figure 1.2: Linkages between theoretical and analytical frameworks to answer the research question. Source: Own elaboration.

Chapter 2. Methodology and research design

The present chapter outlines the methodology and research design to address the research question of this thesis. It first outlines the research approach, choosing the case study approach as a suitable research strategy. It identifies the first inter-*comunal* BSS in Santiago, Chile, as a relevant case study due to the specificities of the governance system to illustrate the decision-making process to deploy it. This is namely 'BikeSantiago', which is the name of the scheme that finally took place from a trans-national investment holding in the Latin-American context.

The chapter then explains the mixed-method approach as the best fit to address the research question. Research methods were set by phases or 'packages' comprising three methods of data collection, which guided the fieldwork. Consequently, a 'convergent design' approach is selected, guided by an analytical model developed at the end of Chapter 4. Similarly, qualitative content analysis and descriptive statistics are first carried out separately, and then the data are integrated by comparing the subject of study – the decision-making processes comprised in the deployment. Results are integrated at the end of Chapter 8 by applying the analytical model developed at the end of Chapter 4. To conclude, this chapter informs of the limitations of the research methodology and ethical issues addressed (see also Saud and Thomopoulos, 2021).

2.1 Research Approach

This thesis aims to analyse the role of the decision-making process of an emerging mobility deployment in triggering transformative adaptations that account for transition processes towards mobility justice scenarios. To achieve this aim, the research considers both qualitative and quantitative research methods to inform and interpret the deploying of the first inter-*comunal* BSS in Santiago, Chile, as the case study under examination. Hence, this thesis assumes a 'pragmatic' epistemology in both design and analytical processes. A 'pragmatic' research approach considers that there is no single representation of the world. Thus, it allows a pluralistic position, bringing diverse representations together through a different type of data set (Tashakkori and Teddlie,

2003; Creswell and Plano Clark, 2018). By recognising that a universal reality does not exist, it questions the power relations imposed by a particular vision of the world. Consequently, as a 'pragmatic' worldview allows gathering both qualitative and quantitative research methods, the mixture here implies accepting that knowledge exists independently of our recognition and interpretation (Bernstein, 2010).

In this regard, the concept of pragmatic epistemology stresses the assumptions on "how we gain knowledge of what we know" (Creswell and Plano Clark, 2018:37). Here, it refers to the knowledge comprised in the different experiences associated with the decision-making process when deploying the BSS BikeSantiago. Therefore, the perspective of this thesis consists of understanding how people's movements across the city are planned and performed when introducing new technology, assuming that some groups of people may face difficulties regarding accessibility issues to their everyday activities. On the one hand, it involves analysing the perception of capabilities and practices when looking at the institutional level. On the other hand, the perception of benefits and disbenefits is also analysed to create linkages between the institutional and the operational level.

Accordingly, the present research designed and conducted a mixed methodology to examine the study subject as a dialectic connection between a constructivist perspective while using qualitative methods and a more post-positivist approach while conducting quantitative research methods (Maxwell, 2011). Likewise, as data collection was designed considering a 'convergent design', no data analysis was carried out between the different methods conducted. In this regard, this research assumed an all-encompassing worldview integrating different databases (Creswell and Plano Clark, 2018).

2.1.1 Case study as a research strategy

For a case study research in urban mobility, emerging mobility schemes and governance, this thesis adopted the view of Gudmundsson et al. (2015:63), who see the transport system "as part of a much broader social system" instead of merely "a system of physical components and operational plans". Here, while decision-making as institutional 'practices' to deploy the BSS as a niche-innovation is the subject of analysis, the sub-national levels as 'semi-autonomous units of decision-making' are the units of analysis

(Oakerson and Park, 2011). Thus, a case study is the selected research strategy approach as it allows exploring: i) a contemporary phenomenon in its real-life context, and a particular context when ii) “boundaries between phenomenon in focus and context are not clearly evident” (Yin, 1998:59). The case study approach is suitable for developing a particular depth and detailed richness of the unit of analysis (Flyvbjerg, 2006; 2013). The case study approach is also ‘driven’ by the available sources in conjunction with the researcher's interest, rather than an ‘epistemological’ conviction (Hard, 2001). Here, the case study approach is a matter of ‘discovering’, allowing an interpretative research perspective (Morgan, 2014).

In addition, process analysis is conventionally approached by an ex-ante or ex-post evaluation (i.e., design, implementation, operation, see, for example, Sapag (2019). However, in analysing the dynamic processes of the BSS deployment through the lens of the theoretical and analytical framework chosen, different sources of data in decision-making are mixed to provide an understanding of the simultaneous institutional dynamics in decision-making. Thus, in order to coordinate efforts, those principles found in the regional business model created for this purpose, tensions, synergies and conflicts experienced in the implementation process are analysed through a public procurement analysis, considering sub-national research applied to a case study in Santiago (Giraudy and Pribble, 2019; Otero-Bahamón, 2019; Eaton, 2004;2020).

Acknowledging the pros and cons of this research approach, there are challenges in designing and conducting a case study in practice (Stake, 2008). One of the critical concerns faced in the methodological design was the balance between the particular governance characteristics of the selected case study and the methods merged for a realistic and adequate design. Addressing this concern required rigour and transparent methodological design and execution regarding all the methodological decisions taken. Therefore, this research was meticulous in all its methodological development.

2.1.2 Mixed-method approach

From the decision-making point of view, the present process analysis converges in a reflexive governance perspective that allows a discussion of the institutional and social challenges faced, requiring different data sets to understand complex phenomena faced

in this niche deployment. This thesis chose a convergent mixed-method research design in accordance with the research aim (Creswell and Plano Clark, 2018).

The core of a convergent research design is to collect and analyse both qualitative and quantitative databases concurrently, integrating the results to develop a more accurate and detailed understanding of the phenomenon in focus. While the data collection and analysis processes occur separately, the integration between the different data sets is done to confirm, disconfirm, or expand the topics raised in the findings (Creswell et al., 2011; 2018). Thus, while the qualitative phase helped to understand the experiences and perceptions that different actors had on the decision-making process and the subsequent outcomes, the quantitative approach sought to visualise benefits and dis-benefits derived from the decisions made (Silverman, 2016).

In this research, the convergent design is created as three-stage methodological ‘packages’, with some degree of connection between them. In this regard, and prior to fieldwork, this research sought to understand how pre-deployment institutional decision-making influenced users' accessibility. However, when conducting the fieldwork, I recognised that the operational levels were very relevant in users’ perceptions of system failures at the earliest stages of the system deployment. This finding was not anticipated when conducting the data collection; however, the service level defined in the public tendering was included in the survey to explore further relationships between the institutional and the operational levels.

This research is also built upon my personal work experience as an investment analyst in Santiago's regional government between 2011 and 2015. This experience helped me to better systematise different decision-making scenarios promoting cycling utility through the BSS deployment. As I was responsible for coordinating different policies and public investment to encourage non-motorised means of transport, it allowed me to become familiar with the different public sources and contribute with a reflective governance analysis by means of this research. Indeed, as part of Santiago's BSS deployment at the regional government of Santiago, this research is the space for reflecting on the institutional successes and failures resulting from this sub-national rationale in decision-making. Therefore, I decided to draw on a mixed-method approach to understand the deployment process and discuss the real institutional and social challenges present

herein. To avoid biases, I sought a careful balance with extra care concerns for validity, reliability and the protocols of data collection processes at all stages.

2.2 Empirical data, sampling considerations and structure of the fieldwork

The design comprised four data collection methods to bring together empirical data on the research aim,: i) secondary data, ii) field observations, iii) semi-structured interviews, and iv) a survey carried out with current users.

2.2.1 Policy/planning documents (secondary data)

Three key references are analysed related to the earliest stage of decision-making to implement the first inter-*comunal* BSS in Santiago:

a) Santiago Metropolitan Regional Government (2012) 'Feasibility study and management of public bicycle concessions for Greater Santiago' (the regional business model)

b) Public tendering for the first Inter-*comunal* Bicycle Sharing System in Santiago (Mercado Publico, 2020. Accessed on 29th May 2020)

c) Itaú Unibanco Holding S.A (2017). Annual report.

These three references comprise research package I of the methodological design (see Chapter 6). They were particularly relevant for a sub-national research, since they contain the set of rules that guided the multi-level decision-making process. On the one hand, the information in the feasibility study's report provided significant inputs regarding the vision of the Regional Transport Development Policies promoting the BSS for utility cycling purposes (Chapter 5). On the other hand, the different public tendering informed about the particular management and negotiations to integrate 14 heterogeneous and semi-autonomous administrative-territorial units - *comunas* - in a unified transport scheme. However, it added significant difficulties to effectively providing a system of that size concerning the aspects tendered and the real possibilities to comply with (Chapter 7). In addition, the Itaú Unibanco Holding S.A, Annual report in 2017 shows the trans-

national objectives which characterised the ‘vertical’ relationship (Eaton, 2020) that financially leverage the deployment of the BSS BikeSantiago.

Thus, these references contributed with significant inputs to crucial institutional and social opportunities and challenges in the governance of the BSS.

2.2.2 Semi-structured expert interviews

Expert interviews were a very relevant data collection method for several reasons. First, as a one-to-one method, they offered a significant in-depth discussion of the research focus, contributing with significant insights through different angles and levels of observation. In this regard, the institutional and operational arenas were observed through the eyes of actors involved directly in the deployment (i.e. public and private sector and users), informing about key specific topics of the BSS process of deployment from an ‘insider’ perspective.

Expert and key stakeholders’ samples were selected regarding their particular role and perspective about the processes of the BSS deployment. According to the study criteria, a sample with known actors helped to identify 25 relevant actors involving both practitioners and politicians at the sub-national level.

The expert interviews sought to identify perceptions and experiences on the following topics: i) the design and implementation of the BSS, ii) the relationships and agreements made by the different actors to deploy the system, iii) the perceived impacts of this relationship dynamics, and iv) the social and urban contribution and the final beneficiary population. Interviews started by asking about the role of each actor in the BSS deployment. The guidelines were the same for each actor. However, some variations were made for some of the actors. For example, the guideline for the service provider level focused more on the operational activities and their role and knowledge on the supply side of the BSS provision. Therefore, this type of inquiry led more to an in-depth interview, oriented towards a knowledge-producing discussion (Hesse-Biber and Leavy, 2004). These operational and logistical insights gave rise to relevant links between the institutional and operational arenas from an insider’s perspective. The following four steps

were designed and implemented to conduct this type of interview perspective (Hennink et al., 2011).

i. A semi-structured interview guideline
ii. A trust relationship between the interview and interviewee
iii. An empathic way to conduct the guideline
iv. A probing and motivating approach in conducting the interview.

As mentioned above, the researcher's previous work experience with the Santiago Metropolitan Regional Government between 2011 and 2015 helped identify previously contacted key actors. To avoid possible biases regarding the interviewee selection, pilot-testing interviews were conducted previously with some people who shared similar characteristics as the selected interviewees. The data collected from them were all made through an email explaining the research and asking them for an appointment to conduct the interviews at the premises of their institutions, in accordance with the research ethics practice and data management regulations.

2.2.3 Field Observation (supply distribution)

Observational methods were applied at the BSS docking stations and fleet distribution vehicles, examining the logistic principles to design the quantitative methods. By identifying the key supply distribution and system performance in general, this information was crucial for the survey design and management.

Taking notes about the logistic practices provided a valuable insight into the operational arenas, which was crucial to the methodological design approach. This was particularly relevant in a context with no unified public dataset of BSS usage at local or regional levels since the database information was a private asset solely managed by the operator. Thus, for the qualitative phase, while the bicycle fleet distribution is the supply side, users define the BSS demand. This observation benefitted from an expert interview with the operator in June 2017 and key operational employees of BSS during September 2017, providing significant insights into fleet management principles used when the system achieved the full capacity in 14 *comunas.* I made notes through the methodological practice of 'shadowing' (Jirón et al., 2016), which consisted of observing the bicycle fleet management vehicles over two days. The first day of monitoring covered conventional

morning and afternoon schedules of a weekday route, and the second day covered a regular weekend fleet balancing route (Figures 2.1 and 2.2).

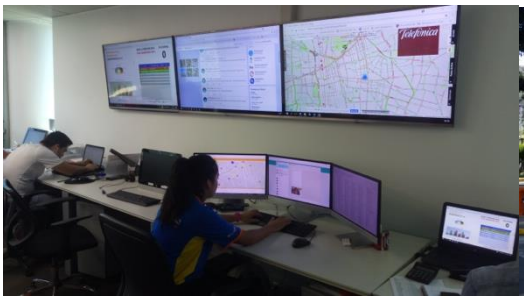

Figure 2.1 (left) Interview with the operator (November 2017). Figure 2.2 (right) Observation of the bicycle fleet (December 2017). Photos: Saud, 2017. Santiago de Chile.

2.2.4 Survey to current users

The quantitative phase of this research examined travel patterns, perceived benefits, system performance and service levels through a BSS user cross-sectional survey. Building upon the previous observations of the supply distribution, the cross-sectional survey was carried out in the five busiest BSS docking stations identified between September and December 2017. The following stations detected through field observations were: Costanera Centre, Pedro de Valdivia, Teatinos – Moneda, Santa Isabel, and Estacion Central. This selection was also based on socio-economic indicators of the selected areas such as income level and transport indicators such as public transport links to include different areas of Santiago, in accordance with the purposes of the feasibility study to deploy the system. Costanera Centre and Pedro de Valdivia docking stations are located in one of the wealthiest comunas in Santiago, Providencia *comuna.* Teatinos– Moneda and Santa Isabel station are located in downtown Santiago *comunas.* Estacion Central docking station is located in Estacion Central, a lower-income level area (Figure 2.3 and Table 2.1).

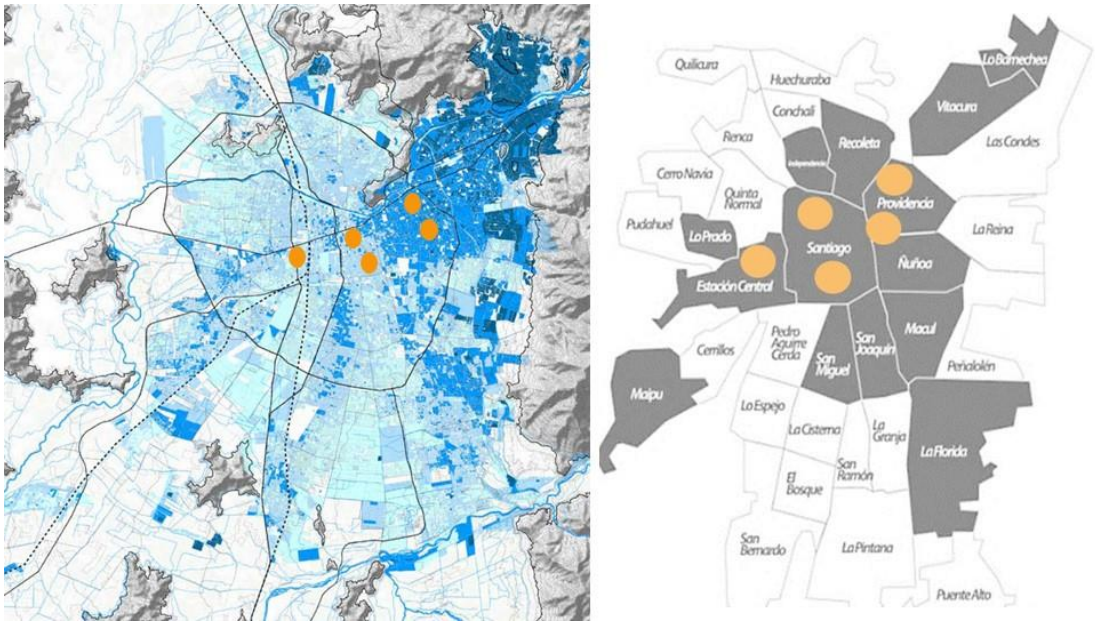

Figure 2.3: Socio-economic distribution map showing wealthier areas in dark blue (left) and *comunas* participating in the BSS BikeSantiago (right). Orange circles show data collection points. Source: Adapted from Santiago Metropolitan Regional Government (2016) and BikeSantiago website (2017).

The survey design consisted of a non-probability convenience sampling with pre-defined quotas, carried out in Spanish and based on a paper-based survey carried out only by the researcher. Survey questions focused on four dimensions of current BSS users aiming at linking travel patterns and the perceived accessibility of BSS users with system performance (Lättman et al., 2016; Martens, 2017) (See Appendix A1 for the survey template):

i) Socio-demographic profile
ii) General urban mobility travel patterns, including travel patterns using the Bicycle Sharing Scheme
iii) Perceived benefits in accessibility, overall benefits in health, saving time and money
iv) Perceived BSS performance and service level (as in the public tendering)

For the questions on perception, the survey design considered a 7-point Likert scale commonly used in Chile (see for example, Ministry of Housing and Urbanism, 2016), thus minimising response bias. The sample size was calculated considering the standard formula for a finite population (1) (Aguilar-Barojas, 2005; Cochran, 2007; Bryman, 2016),

applying the data collected in the previous phase regarding the bicycle fleet balance in these busiest key stations. The daily average of the BSS usage varied from 60 to 180 bike hires per busiest station previously identified; therefore, 480 bicycle relocations were observed during fleet balancing operations. Thus, the study population (N) was estimated to consider 2,330 bicycle hires, assuming the highest margin of daily BSS usage per station. The survey coverage was designed in a range between four and five consecutive working days in the selected five busiest stations, as summarised in Table 2.1. Thus, a sample of 343 users comprised the required sample size for this finite population of 2,330 current users, considering an expected heterogeneity level of 50% and an error margin of 5% at a 95% level of confidence, as in the formula below.

$$n = \frac{N * Za^2 p * q}{d^2 * (N-1) + Za^2 * p * q} \qquad (1)$$

considering:

N= 2,330 users based on the BSS Population (taking into account daily fleet balancing operations at the 5 busiest stations)

Confidence Level = 95% (Considering Za=1.96)

Error margin (d) = 5%

*Expected proportion of variance (p*q) = 50%/50% (0.5*0.5)*

Table 2.1: Sample and survey distribution design at busiest BSS stations – Source: Own elaboration based on observation and BSS BikeSantiago database (2017).

Stations	**Socio-economic Classification by area**	**Daily BSS usage**	**Field work days**	**BSS Population**		**Respondents by station**	
				N	**%**	**N**	**%**
1. Costanera Centre	East Area - high-income level	180	5	900	39	124	36.2
2. Pedro Valdivia		70	4	280	12	58	16.9
3. Teatinos - Moneda	Inner City - media income level	100	5	500	22	70	20.4
4. Santa Isabel		70	5	350	15	48	14
5. Estacion Central	West Area - medium / low-income level	60	5	300	13	43	12.5
TOTAL	**5**	**480**	**24**	**2,330**	**100**	**343**	**100**

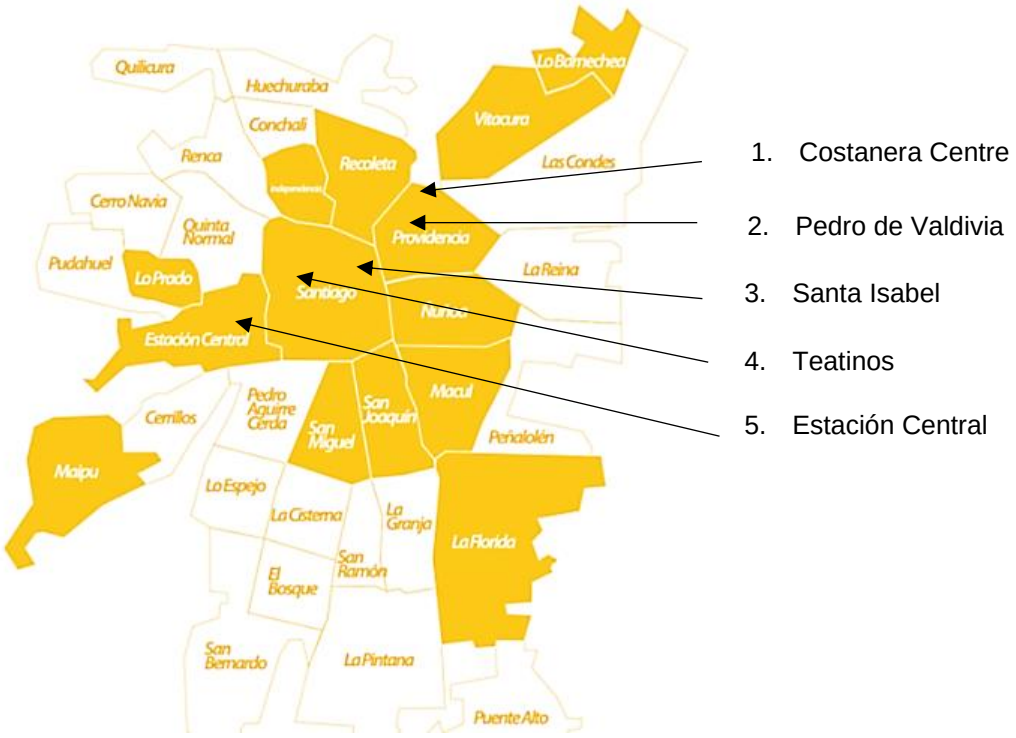

Figure 2.4: Santiago de Chile inter-*comunal* Bicycle Sharing System. Source: Adapted from BSS BikeSantiago (2017).

Table 2.1 summarises the components of the formula used for its distribution in terms of socio-demographic characteristics, daily usage and fieldwork design. The respondents by station were calculated in accordance with the fleet distribution, justifying the study design decisions and the data collection process. Bicycle fleet availability, as daily BSS usage data, at each BSS station is also included in Table 2.1. The recruitment for the sample was done by approaching users when they were collecting or returning a bicycle at the selected BSS docking stations.

2.2.5 Semi-structured interviews with current users

During the earliest stages of data collection through the survey, I perceived a high level of motivation from respondents to further discuss the service level topics assessed. I particularly noticed that respondents tried to explain the score by connecting some of the topics to provide a possible explanation as well as to express their concerns, with a

particular focus on how their trips were recorded and the subsequent payment and fee structure. Thus, in order to offer appropriate space for these concerns raised, two open-ended questions were added at the end of the survey, asking about their positive and negative experiences while using the system, emphasising perceived benefits in accessibility (Lättman et al., 2016; Martens, 2017) and their experience with service levels. Thus, 10% of survey respondents were further interviewed, based on convenience sampling and stratified by gender at each station, with a total of 35 interviews being collected.

2.3 Methods of analysis

This thesis defined three approaches to analyse the different sources of data: i) documentary analysis, ii) qualitative content analysis and iii) descriptive statistics (survey analysis). In this regard, documentary analysis and Qualitative Content Analysis (QCA) focused on the values and practices comprised in the decision-making scenarios, both public and private, on the one hand. On the other hand, descriptive statistics provided an overview of the travel patterns and perceived benefits and disadvantages of incorporating BSS into daily activities.

2.3.1 Documentary Analysis

This analytical approach refers to the analysis of relevant documents that contain information about the decision-making process. The three selected sources of information (further described in section 2.2) were assessed for criteria on relevance, reliability, and origin, selected by the source of publication (government institutions as well as private institutions) involved in the deployment.

The BSS feasibility study, which incorporates a business model for the deployment of the system, is the first part of the analysis (Chapter 6). This chapter seeks to provide an understanding of the institutional rationale behind the BSS regional business model in Santiago as a planning tool and its role in triggering a mobility justice transition.

The analysis in Chapter 6 examines the set of rules that guided the subsequent decision-making scenarios through the lens of the business model innovation framework (Chapter 3), considering the key components of a business model: i) value proposition, ii) value creation and iii) value capture, and then integrating these findings with MLP in the various phases of the analysis (Bocken et al., 2013; van Waes et al., 2018). Chapter 6 also incorporates an analysis of the different public tenders to implement the BSS in Santiago, highlighting similarities and differences between the participating *comunas* as well as the links between the BSS feasibility study and the implementation process that took place.

The data collection process was an online search in mercadopublico.cl, an electronic platform where public institutions in Chile place public tenders. The original documents of the public tender were found by using keywords. The information is categorised by date, conditions created for the concession of the public space, the type of tender, as well as obligations and general characteristics. The technical offer and projection basis were also included to express the different characteristics tendered between the *comunas.*

2.3.2 Qualitative Content Analysis

Mayring (2010) has described Qualitative Content Analysis (QCA) as a set of techniques comprising a systematic analysis of different kinds of texts addressing not only the explicit content but also core ideas in the full data set (Drisko and Maschi, 2015). As some of the core qualitative data of this research come from semi-structured interviews, both with experts and stakeholders as well as users of the system, Qualitative Content Analysis is the method selected. It allows a more descriptive and interpretive focus, ‘expanding’ the original data (Drisko and Maschi, 2015; Hsieh and Shannon, 2005), for example, when considering the institutional perceptions of the decision-making process as well as the service levels.

Although there are many qualitative research methods, some of them similar to QCA, such as thematic analysis (Boyatzis, 1998) or discursive analysis (Hill, 2011), QCA suits best to discuss less explored topics, as it allows a flexible but systematic description and interpretation of a complex phenomenon. It can also be either inductive, deductive, or both (Schreier, 2012). In other words, while inductive categories lead to the development

of theories that emerged from the data, deductive ones further contribute to existing theories. This thesis considers both deductive and inductive coding processes as an interlinked data analysis structure. In this regard, while the core analytical task gave rise to crucial institutional social and institutional challenges when deploying the BSS, it was eminently an inductive task when structuring the topics raised at the beginning of the analysis. However, I guided the analysis with the conceptual framework, influencing the inductive reasoning (Hennink et al., 2011). Furthermore, QCA also allows exploring the relationship between the concepts, helping to define initial codes and interrelation derived from the data, based on a rigorous process of validity and reliability (Schreier, 2012). Thus, the initial coding system started identifying the key concepts, providing an operational definition derived from the theoretical framework (see Chapter 4 for further detail).

Considering the assumptions made in the decision-making process, the analytical focus mixed different frameworks regarding the sub-national and the trans-national levels. This relationship is particularly relevant in this thesis due to the vertical/horizontal inter-governmental challenge that this thesis poses in the form of trans-national institutions and their preference for building key partners with the sub-national governance regarding the degree of autonomy (Eaton, 2004;2020), and thus break into the public sphere (Andion et al., 2012).

Furthermore, in exploring the rationale for institutional decision-making, the research focuses on the structure of the arguments by gathering stakeholders' perceptions about the agreements made (Martens, 2000; Martens and van Weelden, 2013), detecting some ‘regularities’ in meanings found (Miller et al., 2013, 1999). Appendix B1 shows the topics raised by the actors, which structure the narrative of Chapter 7. As the research subject focuses on the decision-making process of the BSS deployment, I separated, in a conventional way, the information regarding the design and implementation and the operational level as different stages. However, it does not mean that they are consecutive. In fact, they occurred almost in parallel, according to the findings.

The process of data analysis comprised three key actions: transcript, creation of categories, and definition of themes. All these actions were carried out exclusively by the researcher. The first part of the process started with transcriptions of interviews and translation into English, selecting the key material to be analysed. Here, the information

was organised first with the original interview guidelines, highlighting the key arguments to extract the core ideas. Second, the initial organisation of the information was conducted by a criterion of content identification with similar meaning and connotations. Third, the creation of the categories comprised the second analytical step.

Categories initially were taken from the literature review, which helped to organise and group the contents. Thus, the data structure and coding scheme led to organising the data into four qualitative categories, derived from the corporate sustainability and paradox framework (see Chapter 4): 1) a Private Social Investment (PSI) as the scheme case, 2) the emerging patterns (collaborative and segregation), 3) aligned benefits, and 4) experienced tensions (Smith, 2014; Stadtler and Wassenhove, 2016; Standtler, 2018), summarising and interpreting the topics raised. Relevant quotes regarding the implementation process are fully displayed in Appendix B.

In this regard, I applied the same notation used by the authors selected in the conceptual framework (the five dimensions mentioned above, adapted from Smith, 2014; Stadtler and Wassenhove 2016, and Stadtler, 2018:335), identifying key patterns and extracting by this data structure and coding scheme.

In organising and grouping the information into the pre-selected categories, different sub-topics were systematised from iterations to extract their further details, interrogating and expanding their meanings. The iterations ended when there was a redundancy in the initial coding system (Schreier, 2012). The definition of the themes for each category was the fourth step. Although this is done by describing and summarising the contents found, the researcher's interpretation becomes crucial. In sum, the QCA approach used in this research seeks to 'expand' the data when the interpretation and the latent content is included in the definition of the themes.

2.3.3 Descriptive statistics

Descriptive Statistics Analysis is applied to summarise and describe the characteristics of the data collected in the survey regarding the social benefits and dis-benefits perceived by users when incorporating the system into their frequent activities, including their travel patterns.

The procedure to analyse this data comprised the following four steps (Plano Clark and Creswell, 2011). Firstly, the data were prepared and explored by cleaning the database and addressing issues of missing data first, in conjunction with the conduction of reliability and validity of the measures. Second, a descriptive analysis for each major variable was conducted, considering means (standard errors), medians, and inter-quartile ranges to characterise the data set. Thirdly, to represent the data, statistical results were summarised in tables and figures, reporting the main results. Fourthly, data were examined in accordance with the hypothesis and the existing literature. Data collected from the survey were analysed by using SPSS 19.0 software (SPSS Inc, Chicago, IL).

In addition, a significant contribution to understanding operational levels in relation to fleet management and travel patterns was made possible by the incorporation of data visualisation tools. This description was made in relation to travel pattern information at the *comuna* level.

Hence, circular dendrograms and an innovative application of alluvial diagrams for the travel patterns of the BSS users were an appropriate method to present and visualise the BSS user travel patterns as origin-destination flow maps across *comunas* within the Metropolitan Region of Santiago. Data are presented at the *comuna* level to illustrate travel patterns, and figures have been generated via RAWGraphs (Mauri et al., 2017). This is an open-source data visualisation software for a quick diagrammatic overview of usage patterns representing BSS demand. This representation constitutes an innovative visualisation for origin-destination flows, allowing interpretations to be made regarding the operational levels.

2.4 Analytical strategy: Integrating qualitative and quantitative research methods

The mixed-method analysis comprises a three-stage qualitative-quantitative - qualitative structure (research packages), considering a convergent design data analysis and interpretation to address the research question.

The first qualitative research package (Phase I) aims to elucidate the rationale that led to the sub-national decision-making scenario, seeking to link the institutional and

operational levels regarding the BSS deployment. In doing so, Phase I comprises two analytical chapters. Chapter 6 analyses the institutional rationale comprised in the business model and the values defined therein, discussing their role in the scheme that finally took place. This chapter also explored, in detail, differences and similarities regarding the two public tendering approaches. This objective seeks to understand the influence of the institutional rationale on the resulting mobility transition pathway within a highly socio-economically segregated urban context. Connectedly, Chapter 7 provides a critique of the different tendering approaches to deploying the BSS. This chapter provides linkages between the institutional and operational levels, highlighting the role of the inter-governmental agreements in fostering and/or hindering the reproduction of inequalities.

The second quantitative research package (Phase II) aims to examine the system performance of the BSS in Santiago, considering travel patterns and perceived benefits in conjunction with a service level assessment to critically discuss the relationship between the planning tools, agreements made and the operational level in both fostering or hindering more equal and inclusive mobility landscapes. As a qualitative third research package (Phase III) of the research methods, it consists of qualitative semi-structured interviews with BSS users to further discuss the service level and perceived benefits.

Accordingly with a convergent research design approach, the intent to integrate the findings of these three phases (Chapter 6, 7, and 8) is based on interpretations that allow links between the different data sets to address the research question. In doing so, I summarise the main concepts discussed at the end of each chapter. After the qualitative and quantitative analysis in each analytical chapter, the different decision-making scenarios discuss the extent to which the quantitative and qualitative results converge, diverge or expand the themes raised. To provide a further understanding of the findings with respect to each stage analysed, this research adopted a “simultaneous integration or merging to develop integrated results and interpretations that expand the understanding to provide comprehensive results” (Creswell and Plano Clark, 2018:221).

The integration of the mixed-method analysis here is done through a narrative (Creswell and Plano Clark, 2011; 2018), by combining quantitative and qualitative results through the Multi-Level Perspective and mobility justice applied to a sub-national research (Ostrom, 1983; Eaton, 2004; Geels and Schot, 2010; Geels, 2012; Mullen et al., 2014; Hrelja et al., 2016; Otero-Bahamon, 2019) integrating the results at the second part of

Chapter 8 and discussing there explanatory factors to expand the findings raised in the analytical chapters (Classen et al., 2007). Indeed, a convergent analysis requires a space to reflect on the findings (Creswell and Plano Clark, 2011; 2018), giving rise to links between the different decision-making scenarios to properly address a mobility justice transition research. Thus, a review of the earliest stage of the deployment process by using the BSS feasibility study (the regional business model, Chapter 6), the Itaú Unibanco Holding S.A annual report (the international investor of the BSS, Chapter 7), and the public tendering, in conjunction with the primary data collected, social and institutional challenges in mobility justice allow visualising the institutional decision-making process for transition-related research (Eaton, 2004; Geels and Schot, 2010).

Related research in transition studies has explored the role of the actors involved in a transition process and the conditions under which they interact in addressing it (Jørgensen, 2012). Similar concerns have been raised by analysing the level of structuring of socio-technical regimes (Geels, 2011; Fuenfschilling and Truffer, 2014) (for further details, see Chapter 3). Also, the case study approach has been widely used by researchers in urban mobility (e.g. Robinson, 2015; Figueroa et al., 2019), which gives support to the present research approach.

In sum, a case study applied to sub-national transition-related research allows placing the focus on the institutional decision-making dynamics, combining the niche, regime, and landscape interactions, when applying the conceptualisation of the Multi-Level Perspective (Chapter 3).

2.5 Limitations of methodology and research design

This research has a range of limitations regarding the methodological design and implementation, but I have sought to compensate for those. The first two limitations described here are more a matter of methodological clarifications.

Firstly, in exploring the rationale that led the decision-making process and its influence on unequal deployments, this thesis assumes a type of research approach that is close to an institutional assessment by identifying different stages of decisions and their subsequent outcomes. However, and considering the aims and scope of this thesis, a

convergent design suits better as it allows providing relevant linkages when looking at different perspectives in decision-making processes rather than an assessment approach. This latter approach may even be appropriate at later stages for future research when aiming at examining broader processes. This is also further discussed in Chapter 9.

Secondly, my position in this research has been shaped in part by my work experience, which allowed me to understand the original BSS deployment process. To address potential biases related to my prior knowledge and the closeness I had with the interviewees in the design and conduct of the research, I designed and collected the semi-structured expert interviews, selecting in a pilot phase those whom I knew previously and requesting from them the contacts of those experts who had not participated in the early stage of the BSS deployment, a process in which I participated.

Furthermore, and regarding the high motivation of the survey's participants to comment in more detail about the failures of the system, it can also be seen as biased for selecting the sample due to the contingency they were facing. Indeed, at the time of the data collection, a civil lawsuit was underway against the service provider due to system failures. This particular fact may have biases in the responses, assuming that I could solve these particular problems. In the face of this fact, I was always carefully explained the reasons for this research, distancing myself from a public entity. In addition, it is worth noting that in the semi-structured expert interviews, responses about perceptions of the agreements made often had a paradoxical or tense and silent character. This issue was further addressed with other questions in order to gain a better understanding of the issue under discussion. By taking into account these issues perceived when conducting the interviews, the appropriate analytical framework was also chosen.

A third limitation relates to the cross-sectional user's survey regarding the limited ability to generalise findings to other cities. Furthermore, applying a cross-sectional survey has also a limitation on the sample chosen as the survey only covered some of the busiest stations. A survey across the whole network certainly would help expand the understanding of the mobility justice issues raised considering peripherical and rural locations, designing tools for equal or more weight to analyse differences in travel patterns. This research highlighted this issue in the selection of stations and the design of survey sections.

A fourth limitation relates to applying the Multi-Level Perspective and mobility justice framework in a single case study. However, it would be more valuable to contrast several case studies with a similar research subject over a more extended period of time, including several years of operation and use, as this data collection was carried out only by the researcher between March and December 2017, according to a convergent design approach and the available resources.

2.6 Ethical issues of the field research

Ethical concerns raised relate to my position in the field, having helped a previous position within Santiago's Metropolitan Regional government. That was evident in many interviews in comments such as 'you know this better than I do' as some of them recognised my previous professional participation. In this sense, the ethical procedures applied were a key aspect for reliable data collection. For example, the consent to give an interview and the subsequent recording was explicitly explained by email, and in-person and protocols were strictly complied with. In addition, while interviews were conducted at the offices of each institution, the survey was carried out in a public space, intercepting respondents when they were collecting or returning a bike. An explanation of the research objective was explained first, asking for their consent, then with proof evidence (by giving a sign or similar). Likewise, all the information collected was handled solely by the researcher. All those procedures complied with research ethics practice and data management regulations (UCL Research Ethics Application: 10045/001).

Finally, I would like to state that, under normal conditions, these empirical materials are usually provided by the operator or some institution in charge. However, during the fieldwork, I realised the complete disconnection between actors and institutions, in conjunction with a fully private scheme, where the information was only managed by the operator of the system. Although the company provided me with the system's database, it contained sensitive information about people's personal data, which was in dispute at the time of data collection as the service provider faced a process of a civil lawsuit due to system failures that ended up affecting users, in particular with extra charges. Therefore, I decided to develop my own data sources and thereby distance itself from the conflict, including encrypting the database provided by the operator.

However, understanding the operational levels constituted my knowledge of interest to further understand relationships between the institutions and organisation when deploying a technological niche in transport, as the managerial aspects are usually disregarded as a research focus.

For the points that I observed and analysed here, in conjunction with my work experience, my knowledge of interest, in fact, relies on supporting institutions and organisations to effectively address low-carbon transportation technologies. However, my main intention is to first emphasise the mobility justice perspective that these deployments require, considering a highly unequal context and weak institutions.

As shown in Chapters 6, 7 and 8, this case study revealed that this political and economic context puts strong pressure on individuals resolving their basic needs with little or no state involvement in addressing public values (Chapter 4), leaving people unsupported in conditions beyond their control. Here people needed an alternative mode of transport, but they also needed a system that works, ensuring their safety and protecting their personal data. There is a need for a system where the government works for everybody as an ally. We need to understand that we need an effective government protecting and addressing public values, competent with their social duties, and sufficiently capable of addressing the real social challenges that we are facing nowadays.

Chapter 3. A mobility justice transition research in Santiago

This chapter outlines the theoretical foundations on which this research is based to answer the research question posed: How might a niche-innovation in transport lead to a mobility justice transition, considering the first inter-*comunal* BSS in Santiago, Chile in the period 2011-2017 as a case study?

To answer this question, the theoretical background in this research lies in a crossover between a Socio-Technical Transition (STT) and a mobility justice framework. The Socio-Technical Transition framework is interested in a medium and long-term, multi-dimensional, and key transformation process, through which established socio-technical systems of production and consumption shift to new radical ones, based on a coevolutionary social and technological change. In doing so, this theoretical background explains how processes of change occur and evolve, assuming a complex social and technological shift that takes place simultaneously across multiple levels and dimensions, such as personal and collective life, institutions, and markets and comprising exogenous factors such as economic and health crises or environmental circumstances.

Transition research has been widely conducted in the Global North context, extensively focusing on sustainable transport futures. Acknowledging the urgency of the environmental issues across the globe, this thesis argues that a transition towards more sustainable futures must challenge urban inequalities, requiring an explicit and well-framed analytical tool, particularly in the context of the Global South. This chapter seeks to provide an understanding of how the processes of deployment of a niche-innovation in transport might lead to mobility justice transition. Thus, this chapter mobilises transition research to a mobility justice framework, incorporating an accessibility and equality perspective to complement the Multi-Level Perspective with a distributional approach.

A mobility justice transition here is understood as a transformative adaptation (Patterson et al., 2017), or adaptive strategies aiming at both, triggering processes of changes and simultaneously creating and/or accommodating alternative systems to move away from unequal and dominant mobility regimes towards more equal and inclusive mobility landscapes.

This chapter is divided into three main components to create the theoretical crossover: Sub-sections 3.1 and 3.2 introduce and discuss the Multi-Level Perspective, explaining the main characteristics of its structure, including the key theoretical bodies in which this theory is rooted. This is in order to support the analytical development required for this research. Then, the three levels of analysis that comprise this theory are explained in detail in sub-section 3.2.1, incorporating the main limitations and critiques in the context of this research. Sub-section 3.2.2 continues with an expanded and applied approach. It considers both a specific multi-level interaction for a sub-national analysis (3.2.2.1) alongside the specific approach discussing the three analytical levels: the niche-innovation, regime and landscape in focus (3.2.1.2).

Subsection 3.4 mobilises debates on transition studies towards research on mobility justice. This sub-section explores definitions of the concept of mobility justice (3.4.1), incorporating social justice principles for a critical perspective on institutional-political dimensions and the distributive spheres when deploying technological niches in transport (3.4.2). Thus, this perspective provides a theoretical basis for critiques of the practices and impacts of justice for research in mobility justice transition (3.4.3). In doing so, the framework of accessibility is introduced as a high-level priority in the mobility justice framework, complemented by a perspective on data management and protection. Finally, research on mobility justice and transport innovations is explored to contextualise the present discussion.

This chapter is also complemented by Chapter 4 in order to provide an analytical background to this theoretical crossover from an institutional perspective (See also Saud and Thomopoulos, 2021).

3.1 A Socio-Technical Transition research

The Socio-Technical Transition literature has recognised four major strands within research in Socio-Technical Transitions (Markard et al.,2012): i) Transition Management (TM), ii) Technological Innovation Systems (TIS); iii) Strategic Niche Management (SNM), and iv) The Multi-Level Perspective (MLP).

Having conducted a careful study of these theories, TM, TIS and SNM are inappropriate frameworks for this research due to their limited engagement with institutional and normative aspects. In addition, they pursue more interventionist objectives, which is beyond the scope of this research.

The Multi-Level Perspective (MLP) is selected as a suitable framework as it works as a conceptual 'map' for tracing and narrating past transitions processes. As a middle-range process theory, it traces and narrates the nature and the dynamics of socio-technical transformations and changes in systems and structures, under the premise that technology is shaped by social, economic, geographical and political forces (Rip and Kemp, 1998; Geels et al., 2007; Geels, 2010;2019). In turn, technologies and technological systems shape and are shaped by human relations and societies, considering the micro, the meso, and the macro-level as 'societal processes' that lead to a transformative process of change (Jørgensen, 2012). This theoretical framework analyses the role of technologies as co-evolution between technology and society to understand the multi-level processes involved in the transition from one socio-technical system to another (Rip, 1995; Rip and Kemp, 1998; Geels 2002; 2004; 2005; 2007; Elzen et al., 2004; Grin et al., 2010). In doing so, it mixes both retrospective and future studies of socio-technical changes (Rip and Kemp, 1998; Geels, 2002, 2004, 2005; Geels and Kemp, 2007; Geels and Raven, 2006; Geels and Schot, 2007, Smith, 2007; Van Bree et al., 2010, among others).

MLP works as a conceptual map for tracing and narrating past and recent transitions, providing an expanded understanding of the action context regarding a particular transition process without interventionism or managerial purposes. The literature in MLP has been widely used to analyse both green technologies and social innovations to sustainable transitions, such as water and waste management (Geels, 2005b), energy and power generation (Raven, 2004; Verbong and Geels, 2007; Geels et al., 2016) as well as in the field of transport (Geels, 2002; 2005a; Sheller, 2015), among others. Considering the heuristic configuration that comprises the MLP in the description and analysis of transformation processes with a retrospective and reflective perspective on the multiple levels, actions and dimensions involved in a change process, this perspective best suits the purposes of this thesis. MLP, therefore, is further discussed in the next subsection, analysing the underlying assumptions, weaknesses and developing the operational definitions that guide the course of this research. Finally, MLP is mobilised

towards the mobility justice framework (Mullen et al., 2014; Mullen and Marsden, 2016), in accordance with the present research approach.

3.2 Socio-technical transition research and the Multi-Level Perspective: theoretical roots

To analyse a transition process as the object of research, this thesis is supported in the view that socio-technical system changes are driven by an interplay between multiple levels, actions and dimensions involved in a change process. In doing so, MLP comprises three interconnected concepts as a level of analysis that guides this research: niche, regime, and landscape (Rip and Kemp, 1998; Geels, 2002; Schot and Geels, 2008; Geels et al., 2017).

A niche has been defined as a 'protected' micro-level space where innovations emerge, being able to gain a basis in specific geographic areas, markets, or by policy support (Schot, 1998; Kemp et al., 1998; Geels, 2007; Geels et al., 2017). A regime consists of a meso level, or the current stable and aligned set of rules and practices involving infrastructure and technology, including policy and institutions, market and industry participating in the system of production and consumption. The landscape concept comprises the exogenous macro-level structural factors that shape and create pressure on the other levels (niche and regime), such as a war or economic crisis (Geels, 2002;2012; Roberts and Geels, 2019).

To arrive at this conceptual development, the combination comprised in the three analytical levels within the MLP is rooted in three key theories (Geels and Schot, 2010): New Institutional Economics (NIE), Sociology and History of Technology (Bijker et al., 1987; 1992) as well as Evolutionary Economics (Geels, 2004; Ostrom, 2007; Fuenfschilling and Truffer, 2014; 2016). It is worth reviewing its theoretical origins to better understand the assumptions, scope and limitations that MLP faces.

3.2.1 Science and Technology Studies

Science and Technology Studies (STS) and, in particular, Sociology of Technology (SCOT) plays a relevant role in the MLP theoretical configuration because of its focus on an integrated vision between technology and society (Bijker et al., 1987). STS goes beyond the conventional 'linear' model (or the so-called 'billiard-ball model') on which technology has an intrinsic technical 'logic', 'introduced' to society to provoke a societal 'change' (Geels and Schot, 2010). To break the course of this reasoning, research in Sociology of Technology shifted the dominant focus of technological determinism from a 'linear' model to a research strategy stressing the 'black box' of technological change research, emphasising the link between technological developments and local practices to understand different actors, alignments and perceptions, on the basis of a detailed case study (Ibid). In this regard, this research focus comprises different actors with different and heterogenic resources, capacities and elements (e.g. knowledge, regulation, people), making possible the understanding of an interlinked relationship between technology and society as different actors moving back and forth between different stages, levels and domains (technical, economic, social, cultural, political), understanding therefore that this relationship is a process.

Thus, socio-technical innovations appeared more related to linkages and heterogeneous networks being built upon as a co-constructed process, a perspective further discussed by historians of technology (Hughes, 1986; Pinch and Bijker, 1984; Staudenmaier, 1985; Misa et al., 2003; Hard, 2001), in an attempt to challenge the idea that technology has an autonomous logic separated from society.

As Bijker (1995:270) describes, a technological design process works "not because the artefact works in some objective sense, but because the set of relevant social groups accepts that it works for them". Thus, these arguments allowed us to go beyond the idea of a linear sequence in technological developments, giving rise to the notion of the 'social construction' of technologies. This perspective is taken up by the MLP, conferring equal consideration when studying a socio-technical change. However, due to the strong focus that SCOT places on local agencies to challenge the linear model, scholars in MLP (Misa, 1994; Jasanoff, 2012; Geels, 2020) have recognised the limitations that this theoretical origin has posed regarding the over-emphasis on the micro-level contingency in the early stages of a technological deployment, arguing that MLP proposes a more constructivist

vision that could balance the micro-insights with the meso and macro levels and, in particular, placing attention on the institutional and organisational roles in the medium and long term (Geels, 2020).

3.2.2 Evolutionary economics

From a naturalistic perspective to understand the economic fluctuations and dynamics of change and human economy (Witt, 2008), evolutionary economics studies processes that transform the economy of firms, institutions, industries, including production, trade and employment.

Nelson and Winter (1982) have emphasised the issues of changes in technology and routines as an evolutionary process as a consequence of economic changes. This perspective focuses on the actions of actors, emphasising their role, knowledge and their ability to compete and innovate in fluctuating environments, assuming scarcity and actors as 'boundedly rationality' (Nelson, 2008). In other words, it implies that their decisions are guided by norms and routines as long as results are satisfactory, or, alternatively, embed a dynamic of adaptive strategies (Nelson and Winter, 1982; Lo, 2004). Thus, it is about the interaction between innovators, entrepreneurs and competitive imitators (Nelson, 2018; Witt, 2008; Witt and Chai, 2019). Geels and Schot (2010) have criticised the notion of 'boundedly rationality' as it emphasises the constraining effects disregarding their enabling character. However, this critique also reveals that the restrictive and enabling character have negative effects related to norms, rules and beliefs.

There are two key components comprised within the MLP that are relevant for this research, considering the decision-making processes of the BSS deployment in Santiago as the research subject. On the one hand, a macro-evolution perspective, or the long term of a technological and economic transformation, assumes that the macroeconomic equilibrium is constantly destabilised by entrepreneurs who introduce innovations, where the trajectory could be highly irregular for long periods (Schumpeter, 1939; Day, 2008). On the other hand, the micro-evolution perspective is taken from this theory by means of the concepts of selection, variation, and self-replication or retention (Nelson and Winter, 1982). While variation is primarily considered as an intentional and directed alignment as a result of technological and organisational novelty, selection is assumed in a competitive

environment, combining novelties or variations from existing systems, triggering processes of technological and economic changes. Finally, retention refers to elements of the variants that have been retained (Nelson and Winter, 1982; Metcalfe et al., 2006; Witt, 2019).

The MLP echoes the key pillars of evolutionary economics. In this regard, MLP recognises that the notions of stability and change are deeply interrelated, suggesting both types of possible scenarios, medium-long periods of incremental changes in conjunction with a brief period of disruption. Likewise, MLP integrates the core assumptions regarding the notions of selection, variation, and self-replication or retention (Geels, 2020). However, it has been argued that the concept of 'variation' requires further discussion to go beyond the 'performative action' towards more 'cognitive' dimensions (Temenos et al., 2017), in line with SCOT approaches.

3.2.3 New Institutional Economics

A significant cornerstone of the MLP is the New Institutional Economics (NIE) framework, also called neo-institutionalism. Unlike the conventional understanding of 'institutions' as an organisational entity such as parliament, business firms, or even the notion of what family is, NIE perspective tries to explain regular patterns of interaction with references to rules, norms, practices, and relationships that influence society's actions systematically (Ostrom, 2007). John (2012; 2018) further explains that institutions are 'arenas' where policy-making occurs, which involves the political organisation, laws, methods and the main components that guide decision-making. Furthermore, Rodhes et al. (2006:xiii) define institutions as rules to "determine opportunities and incentives to behaviours", setting the rules of the game towards decentralised decision-making (Faundez, 2016; North, 1990). In addition, Ostrom and Crawford (2005) have argued that rules can be formal, for example, the constitution that guides a political system as well as regulatory frameworks, such as the operation of economic groups, or the set of rules that guide public goods provision. Rules can also be informal, posed as habits, beliefs, or practices, aside from formal planning, and both can be mixed in practice. This mix introduces significant challenges as it involves a pivotal discussion for understanding what an institution is and what it does in practice, unfolding the classical structure and agency duality, further discussed in 'Structuration Theory' (Giddens, 1984). Indeed,

Giddens's theory (Ibid) discusses the influence or determination of the rules over individuals' behaviour, attending to a dual relationship between institutional embeddedness and social practices. Thus, while institutions can be considered as structures independently of the individuals involved, rules are also part of a socialisation process as two sides of a single coin. Here, actors are seen as "knowledgeable agents, who interpret and apply rules creatively" (although within constraints) (Geels, 2010:504).

The relevance of the NIE framework to MLP, considering the aim of this research in analysing the role of decision-making processes and the focus on the policy and technical instruments, comprised in the first inter-*comunal* BSS in Santiago, can be summarised in three key aspects: i) neo-institutional theory's conceptualisation of the set of rules and norms enshrined within an institution, whether formal or informal, and which present different logics and degrees of structururation (Tolbet and Zucker's, 1999; Thornton et al., 2012; Fuenfschilling and Truffer, 2014), ii) the emphasis that organisations operate in economic, social and institutional environments, as an interrelated system comprised by actors, actions and relations, or what is a so-called 'arena' (McAdam and Scott, 2005; Beckert, 2010), and iii) the institutional 'arena' comprised in the MLP entails a dynamic interaction between different actors, who experience tensions and complexities in the process of adaptation to institutions while strategically influencing them (Oliver, 1991; Garud et al., 2007; Cairney, 2018).

To end these brief theoretical roots, Figure 3.1 shows the crossover between the three theories described.

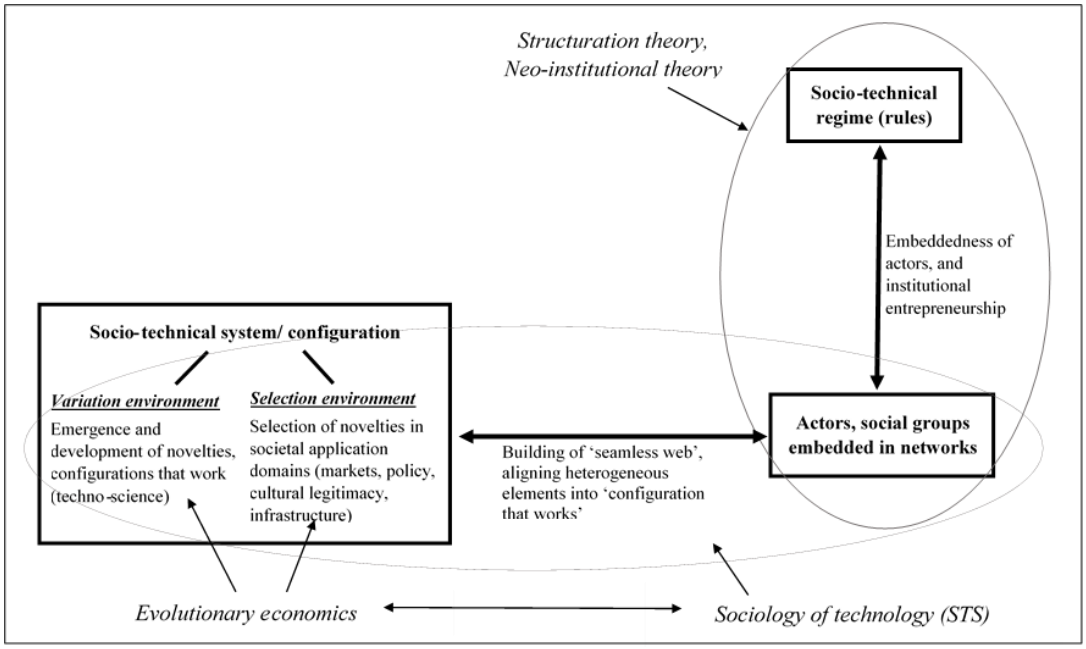

Figure 3.1: Theoretical crossover between evolutionary economy, sociology of technology and neo-institutionalism or NIE theories. Source: Adapted from Geels and Schot (2010:53)

3.3 Multilevel perspective: key assumptions in technological innovations

As mentioned above, MLP pursues more retrospective objectives in conjunction with a future-oriented research approach, seeking to obtain significant insights of past transitions to address and manage current and future ones. This perspective assumes that these changes occur through the interaction of complex social and material change across the micro, meso and macro levels and different societal and institutional dimensions (Geels, 2004; Elzen et al., 2004; Grin et al., 2010). Therefore, transition research relates to a complex multi-scalar process, comprising medium and long timeframes of fluctuations (Grin et al., 2010; Schot et al., 2016).

Conceptually, the three analytical levels – niche, regime and landscape - illustrate the understanding of processes through two key concepts: 'path dependence' and 'path creation'. On the one hand, path dependence refers to the lock-in mechanism (Klitkou et al., 2015) of existing techno-economic systems, that is, social, cultural and cognitive dimensions, such as lifestyles, as well as institutional and political arenas, which influence a transition. On the other hand, 'path creation' (Garud et al., 2010) comprises new arrangements, alliances, agreements, and coalitions to intervene in a current system and sustain a process of change (Farla et al., 2012; Markard et al., 2016).

MLP describes the timeframes of fluctuations with the following four phases, as illustrated in Figure 3.2 (Geels 2002; 2019): i) experimentation, ii) stabilisation, iii) diffusion and disruption, and iv) institutionalisation.

As Geels (2019) explained in relation to Figure 3.2 that the first phase of any technological deployment towards a transition, called 'experimentation', is characterised by trial and error in the institutional, economic and social domains. In this phase, novelties require overcoming the tendency to remain unreliable, isolated and short-lived 'solutions'. In the second phase, 'stabilisation' comes about from an orchestration between a flow of resources, learning processes, standardisation, in conjunction with socio-cognitive activities to stabilise the trajectory of a technological deployment and make it familiar to the society. 'Diffusion and disruption' take place with the internal technological-drivers in conjunction with the support given by a set of norms and rules for their accommodation, also called the 'window of opportunity', as a result of the alignment between the three levels to modify existing systems. However, significant tensions arise in multiple dimensions simultaneously when the existing systems are being destabilised in the early stages (Phase 1, Figure 3.2). Due to the multi-dimensional challenges, a technological deployment may not be able to survive. However, if they succeed, the next phase comprises the replacement (or part of) previous socio-technical systems, transforming a novelty into a formal system.

The described dynamics, however, envisage several ways in which a change takes place. Patterson et al. (2017) outlined four types of processes of change, developed as 'transition pathways': i) a socio-technical transition as a co-evolution between social, technological, economic and institutional changes, ii) a socio-ecological system as a resilience process of change, iii) sustainability pathways, focusing on local bottom-up initiatives empowering marginalised actors, and iv) transformative adaptations, aiming at both, triggering a process of changes and simultaneously deploying alternative systems. These authors also highlight that sustainability pathways and transformative adaptations are more concerned with critical perspectives on ideas of transformations rather than conceptualising trajectories of change per se. However, what is relevant in this research is to analyse the links between a mobility transition trajectory embedded in a socio-spatial unequal context as in Santiago.

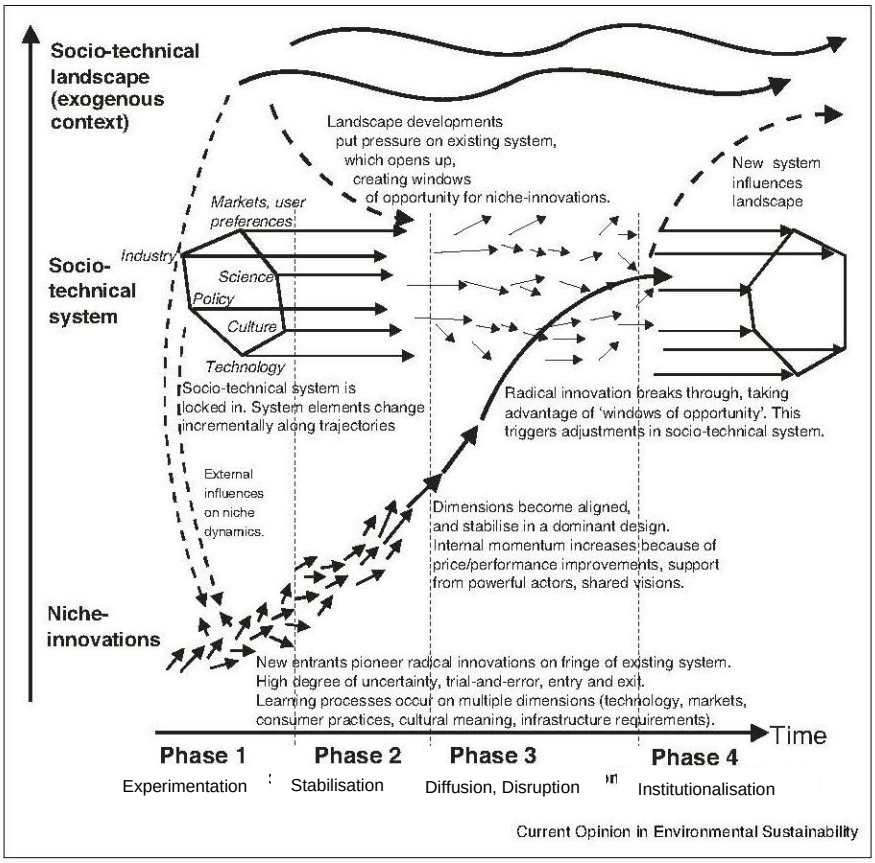

Figure 3.2: Multi-level perspective on socio-technical transitions. Source: Geels (2002; 2019)

3.3.1 The three analytical levels in the Multi-Level Perspective

Having settled the MLP framework for the present research objective, this sub-section further develops the specific focus on the notions of niche, regime, landscape for an analytical approach.

The overall dynamics between the micro, meso and macro level comprised in a technological deployment is illustrated by the MLP as a process theory. Framed by a 'constructivist' narrative (Hard, 2001), it consists of the following premises: (a) niche-innovations build up a momentum allowing them to upscale, based on an instance of support, such as politicians and related organisations, (b) changes at the landscape level create pressure on the regime and (c) current regimes are destabilised, opening a window of opportunity for niche-innovations to upscale and disrupt the existing systems.

The alignment of these levels enables the breakthrough of novelties in markets, society and everyday life, competing with existing regime as an initial trajectory of a transition process of change (Geels and Schot, 2007). The definitions used in this research regarding these conceptualisations are presented below.

3.3.1.1 Niche-innovations

Early literature on transitions (Hughes, 1986; Rip and Kemp, 1998) explained that a transition process starts with the development of a new technology in a so-called technological niche. This niche can be seen as a 'seamless web', indicating the occurrence of alignments between different elements, measures, contexts and actors (involving artefacts, entrepreneurs, banks, regulators, users). Thus, the notion of niche-innovation is defined as an alignment between multiple actors, a novel technology and the creation of supporting measures for its deployment, on the basis that technology is a social construction. An innovation niche is therefore conceptualised within MLP theory to refer to how an innovation emerges and how it triggers change processes. Geels (2012) has described niche innovations as 'protected spaces' or 'instances of support' by means of different measures, resources, skills, referring to a 'supportive' network which is eventually strengthened by the integration of expectation, goals and vision between different actors (Schot et al., 1994; Kemp et al., 1998; Schot, 1998; Hoogma et al., 2002; Geels, 2005). Literature on niche-innovations has indicated three components: 1) a particular domain of use, 2) a heterogenic web of actors, ranging from a particular sector or industry as well as supportive institutions, and 3) specific areas for a niche to emerge (Schot, 1994; Geels, 2012), "without being subject to the selection pressure of the prevailing regime" (Markard et al., 2012:957). As this happens, a niche eventually strengthens its configuration to upscale (or the so-called 'momentum').

Considering MLP as a process theory, the notion of niche-innovation- in the context of this thesis focuses on the creation of a particular network of markets, actors, technologies, governance schemes, with articulated expectations, visions and resources all together involved to some degree and at some point in time, and sharing a common sense that brought them together with a motive or purpose to trigger a process of change. Furthermore, as it involves here a new urban mobility practice, this articulation comprises the creation of 'adaptive strategies' translated to alignments and arrangements and linked through common and individual values.

A niche-innovation in transport is a relational matter involving the three components mentioned above. Therefore, this thesis pays special attention to a particular business model, a tendering process as well as a certain type of operational management comprised in the first inter-*comunal* Bicycle Sharing System (BSS) in Santiago as the constituent elements of such a system as a niche-innovation in transport. Therefore, this thesis provides an understanding of what outcomes are expected through the BSS in Santiago, what type of alignments take place, how benefits are distributed and between whom. In doing so, this research highlights the rationale that brought them together and the 'instance of support' they are finally attached to. Further, this 'orchestration' or the relationship envisioned and created between different actors in Santiago, is motivated by a complex combination of welfare, benefits and profits, so this thesis considers essential to analyse how this alignment can foster or constrain the reproduction of inequalities, as well as the existence of mechanisms that can challenge it, as adaptive processes of change.

3.3.1.2 Regimes

Following Rip and Kemp (1998:388), the regime concept relates to "the rule set or grammar embedded in complex interdisciplinary practices, production processes of technologies…skills and procedures, ways of handling relevant artefacts and persons, ways of defining problems, all of them embedded in institutions and infrastructures". This conceptualisation takes a political science perspective based on Nohlen et al. (1998:548) referring to "an institutionalised set of principles, norms, and rules that fundamentally governs the actors".

To contextualise the approach with which the notion of regime is used in the context of this research, the definition of 'mobility regime' is introduced in order to complement the definition of the latter authors. 'Mobility regime' refers to "a specific set of principles, norms and rules that govern the mobility practice" (Kesselring, 2015:576). Therefore, this set of rules would be determining who is allowed and able to move, how, and under what conditions (Sheller, 2018). This conceptualisation aims at understanding how movements are regulated as a distributive matter and how they eventually become a stable pattern from physically measurable 'materialities' (e.g. infrastructure, software, services), as an expression of beliefs, practices, traditions (Rhodes, 2007) and formal and informal rules (Ostrom, 2011). In this sense, 'mobility regimes' consist of not only the physical provision

comprised of a new ‘means of transport’ but also the dynamic process on which different institutions are creating, enabling, and also ensuring - or not - the conditions to improve, modify or increase/decrease the movement of people (Docherty et al., 2018).

Thus, the regime concept in the MLP in focus appeals to the ‘deeper structural rules’ (Jørgensen, 2012), and in this thesis in particular, to governance emerging mobility rules that drive the scope and character of decision-making processes, driving the corresponding course of action in a particular geographical, institutional and organisational context. Therefore, it refers here to the rationale in decision making aimed at keeping the current system stability, shaping institutional and organisational practices and processes as a result of values, beliefs and rationale (Harvey 2006; 2009; Geels, 2012; Schwanen, 2016). This thesis gives rise to questions about the governance of a niche-innovation in transport, terms of: “the why (the public policy function), what (the set of rules), who (the networks of actors and their position, power and objectives), and how (the manner in which the public is involved and accountability and transparency are maintained)” (Docherty et al., 2018:117-118).

To contextualise this discussion with an emphasis on the process of deployment of the first inter-*comunal* BSS in Santiago, the private sector is moved by financial incentives considering revenues, cost and returns as the values driving these deployments. On the other hand, the public sector is expected to set the rules of the game. However, in line with Docherty et al. (2018)’s ideas, there is a crucial debate about the power relations in mobility governance, where one of the main concerns is how to address the delivery of more, not less, public value with the arrival of these new technological deployments, considering the case when they are governed by a transnational corporation.

Mobilising the discussion towards the conditions under which the deployment process of the BSS in Santiago could lead to a mobility justice transition, this thesis places the focus on different actors and decision-making scenarios. From the Multi-Level Perspective on transitions, Roberts and Geels (2019) discuss the conditions under which decision-makers trigger a transition, focusing on a dynamic based on rapid diffusion and irruption and highlighting the importance of decision-makers’ own volition and the policy context that surrounds and conditions them. Contextualised from a political and institutional point of view, these authors highlight two transition patterns that operate by destabilising the regime level. On the one hand, the landscape or external/structural factors execute

pressure creating a ‘critical juncture’ or a pivotal episode in conjunction with an imbalance of the power domain between a niche innovation and the regime level. In the context of decision making, these authors identified that external pressures that policymakers face (namely business interests, mass public, technological developments) and policy internal developments (or changes and/or re-alignments in the definition of collective problems and the way by which institutional decisions and agreements take place) were relevant to destabilise current norms and rules and trigger the process of change (Figure 3.4).

In other words, this conceptualisation to understand a transition process refers to the conditions under which a stable set of rules and lock-in mechanisms are destabilised for changes to occur, arguing that significant policy change comes about from struggles between "incumbent coalitions and challengers, which eventually lead to major defections and policy reorientations" (Ibid:224). Thus, these enabling/weakening forces are argued to be created by “external forces, like technological or demographic change, and large shocks, such as military conflict and economic downturns” (Hacker and Pierson, 2014:656), unlocking conventional and existing policy practices, opening up instances of defection that trigger processes of change. This narrative is conceptualised by the authors as in Figure 3.3, which is an adaptation from Figure 3.2, illustrating political defection with the thick arrow in the Multi-Level Perspective. This idea of ‘defection’ and a subsequent policymaking re-alignment arena is explained as a loss in the degree of lock-in mechanism, which provides an opportunity for a niche-innovation to upscale, which can be crucial to understand a mobility justice transition in the context of this research.

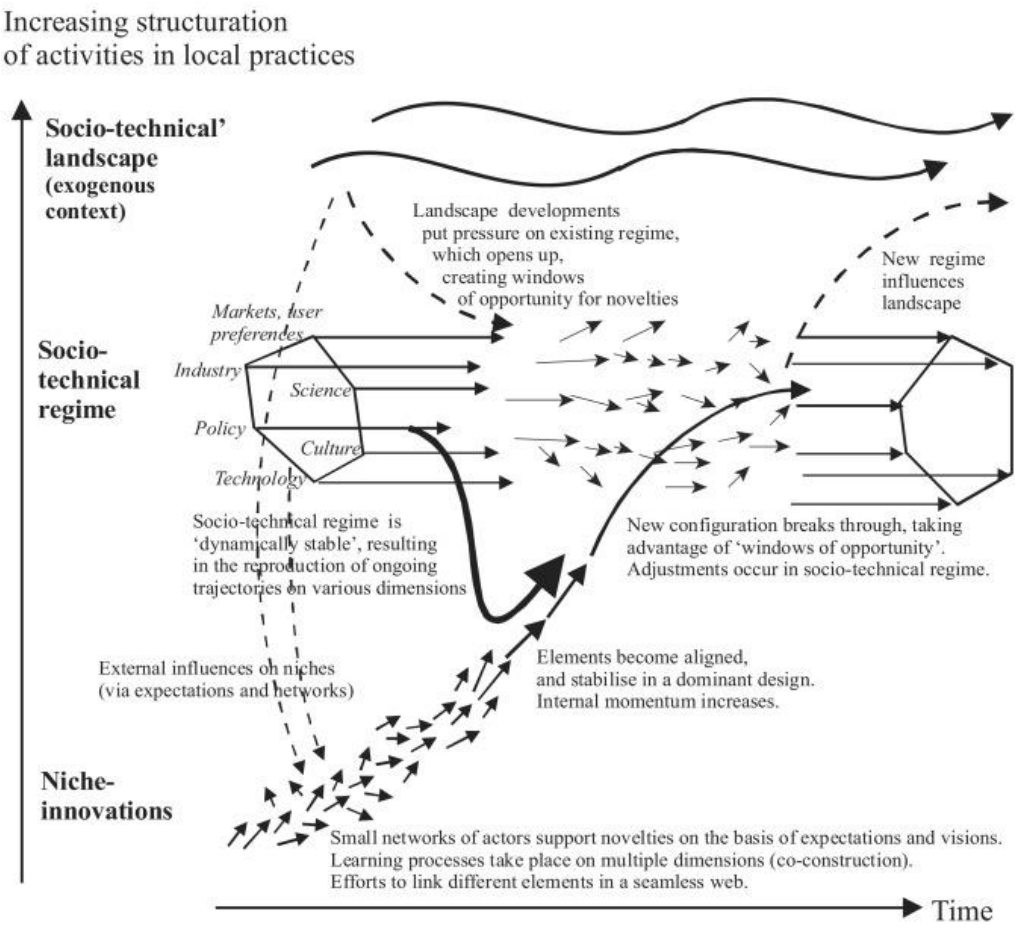

Figure 3.3. Conceptualizing political defection through the MLP illustrated with the thicker arrow. Source: Roberts and Geels (2019).

This thesis argues that a 'defection' strategy depends on how the state's involvement is viewed. In 'enabling state' contexts, where state actions refer to "just enabling the opening up of markets " (Docherty et al., 2018:117) (further addressed in Chapter 4), the notion of 'defection' could also be seen as an institutional decision-making strategy considering both, either by weakening, compacting or expanding and/or by a flexible set of rules comprised therein. Therefore, it is essential to analyse the nature of a given niche-innovation deployment, the institutional settings as well as the pressures of the landscape in order to provide an understanding of a transition character. This conceptualisation also makes clear that the separation between niche and regime is blurred, in particular in contexts with a flexible set of rules, norms and practices.

In order to operationalise the notion of 'regime' under the latter argument described above, this thesis focuses on the notion of 'arena' (Chapter 4), emphasising that

organisations and institutions operate in economic, social and institutional environments as an interrelated system comprised of actors, actions and relations (McAdam and Scott, 2005; Beckert, 2010). In this research, the focus is on an 'enabling state' creating 'enabling environments' (Carroll, 2012; Docherty et al., 2018; Geels, 2019), emphasising the context when governance structures, or some components of them, are by nature flexible and weak, like in the Chilean context (Eaton, 2004). This emphasis is part of a critical institutional perspective raised by this research, considering the case of the first inter-*comunal* Santiago de Chile' BSS. Here, the BSS as a niche innovation faced 'weak' regimes, that are institutional systems at the sub-national level with little power, capabilities and resources, and an external pressure conducted by a dominant transnational sector introducing the BSS in Santiago as a social 'cause' (Chapter 4).

3.3.1.3 Landscapes

The concept of landscape is the next analytical level in the MLP. The socio-technical 'landscapes' refer to a 'wider' context beyond the niche and regime interaction (Geels, 2012). However, this level influences and shapes the relationship between the niche and the regime. Indeed, in mobility and transitions research, the influence of landscape factors, such as industry and market trends, may foster or constrain the scaling up and stabilisation of niche-innovations (Schwanen, 2016). To trigger processes of innovation and modification/adaptation of the current systems, these processes involve an alignment between the three levels to generate a so-called 'window of opportunity' or the socio-technological shift from one system to another, as explained above (Geels, 2012; Geels et al., 2017; Hopkins and Jenkins, 2019).

Rip & Kemp (1998) describe the concept of 'landscape' both in a literal and metaphorical sense regarding those dimensions and elements that surround us and of which we are part. Later on, the literature on transition argues that the landscape level comprises both slow-changing trends such as ideologies and cultural and socio-demographic factors, medium-term ones, such as broad developments in markets and industry, as well as short-term shocks, such as economic crises, fluctuating oil prices, or wars (Temenos et al., 2017; Geels et al., 2017; Geels et al., 2018). This conceptualisation also involves socio-spatial context factors, such as particular environmental awareness (Geels et al., 2016), e.g. a certain area constantly affected by earthquakes. However, literature in MLP has mainly focused on the niche-regime dynamic so far. Indeed, little research has been

done focusing on the landscape level as it is assumed to be an exogenous factor or as a slow-changing condition eventually modified with a niche-regime dynamic in the long term. Meelen et al. (2019) invite us to reflect on the landscape level as a geographical and spatial concern in the adoption of sustainable innovations. This thesis calls for thinking about fairer cities in a transition to sustainability.

While recognising that the proposed dynamic between the three levels of the theory is valuable in providing a 'big picture' (Roberts and Geels, 2019), the criticism of the MLP's hierarchy between the three levels is evident (Shove, 2010) if the focus is placed on the niche levels as a Cartesian relationship (Figure 3.1), as it tends to emphasise on the 'artefactual' aspect of the technology. Therefore, the landscape would assume a secondary role. Indeed, Whitmarsh (2012:485) has referred to the landscape level as a 'black box' in which "anything that does not readily fit at lower levels is placed", which expresses this lack of attention or, alternatively, the artefactual focus. However, if we look at this level in a multidirectional sense (vertical and horizontal) (Figure 3.4), the value of this macro-level analysis lies in its possibilities to recognise, visualise and understand the particularities of institutional and organisational practices, along with the instruments, individuals and institutions emerging from the micro and the meso levels that coexist and shape the landscape. In this way, the sub-national level becomes relevant. Furthermore, this multidirectional sense also incorporates the understanding of a political re-alignment of vertical forces interested here in the sub-national levels due to their degree of autonomy (Eaton, 2020), modifying current regimes and realigning them (weakening, compacting or expanding).

In the context of the Santiago BSS, the external pressure responds to the global trend to deploy such systems as a 'best practice' (Montero, 2020). While the circulation of a BSS as 'best practice' is globally widespread as a policy trend among cities in terms of the benefits that its implementation brings, this thesis also recognises at the landscape level, the current pressure exerted by global corporations (or the transnational level) acting both in the provision of mobility services and as sponsors in charge of these systems. Interestingly, it is also possible to observe a 'voluntary' willingness of sponsors, as in the case of corporate sustainability and philanthropy. The present case study is an example of this idea (further discussed in Chapter 4).

Acknowledging that the concept of landscape comprises ‘exogenous’ slow-medium and shock changing trends, this concept here is also seen as a space to discuss and provide a more reflexive perspective on visions, values and scopes with respect to the pressures and structural factors that drive global corporations, as in many cases it is they who ultimately govern these systems.

A transition is a complex and non-linear process, especially in contexts where they often occur in a chaotic, incongruent, undesirably dominant, but also synergistic manner at the same time. Thus, this approach to the landscape level allows going beyond focusing on the immediate factors comprised in the niche and regime interaction (such as restrictions, methods, regulations) and provides more reflective governance and organisational analyses. By creating a retrospective 'big picture', it is possible to analyse complexities in the different stages of the BSS deployment and, at the same time, provide an extended perspective to contextualise a path-dependency and change that account for a mobility justice transition. Unlike other trends in transition research which have an interventionist character (Loorbach et al., 2010), this approach to the landscape level contributes with a retrospective reflection for future navigational charts to envision and guide a transition process in the making, as a complement to more interventionist agendas.

3.3.2 The Multi-Level dynamic: emerging mobility deployment and the sub-national levels

As a middle-range theory, MLP seeks to outline a transition phenomenologically with the niche-regime-landscape model, applying empirical research to contextualise actors, activities and mechanisms (Geels, 2007). A variety of historical and contemporary case studies have applied the MLP to examine socio-technical shifts from one system to another regarding different societal areas. In the field of transport, transitions were mapped in a broader conceptualisation of urban mobility (Moradi and Vagoni, 2018), or in a particular field such as electric vehicles (Mazur et al., 2015; Berkeley, 2018).

In the context of emerging mobility schemes, O’ Tauma (2015) has employed the MLP to explain how the Bicycle Sharing Scheme in Dublin took place, giving rise to the physical, social and technological dimensions comprised in the scheme’s introduction and the knock-on effects – or ‘ripple’ effects with a close zoom in. Findings showed that public

bikes are fostering greater integration both geographically and institutionally, generating a ‘momentum’ in further adoption with new users. Meelen et al. (2019) contributed with research based on the spatial dimensions of the three analytical levels of the MLP by analysing the levels of adoption of car-sharing schemes. However, little research has been conducted in emerging mobility deployments with a focus on institutional and organisational configurations, focusing on different decision-making scenarios and scales as a subject of analysis.

As the aim of this research is to analyse the role of decision-making processes, providing links between the institutional and operational spheres in doing so, this research focuses on the policy and technical instruments, individuals, institutions and organisations. In this regard, this focus poses significant institutional and social challenges, specifically associated with the conditions under which different arrangements and dynamics take place towards transformative processes of change in systems and structures and how these operate in practice.

Thus, the usefulness of the Multi-Level Perspective in mapping and narrating a deployment process is highlighted as relevant, in particular, when giving rise to sub-national complexities supporting new technological deployments in transport within a highly unequal context of decision-making (Eaton, 2004; OECD, 2018). MLP has a spatial-geographical challenge, here addressed by focusing on the sub-national level (local-regional). If Figure 3.4 is interpreted literally, the MLP could imply that innovations emerge as an interaction between the local and regional levels, and the landscape is considered in this research as the urban structure resulting from a dominant rationale that exerts an external pressure from a higher scale. Special attention is given to the basic units of decision-making, which comprise the unit of analysis. Figure 3.4 is used to outline the particular focus that this thesis adopts to analyse the multi-level interaction at the sub-national level. This figure explains the co-evolutionary trajectory between the three analytical ‘levels’ where niches are embedded within regimes, eventually moving away from A) to C). (Geels, 2004; 2010; 2012; Schot et al., 2016).

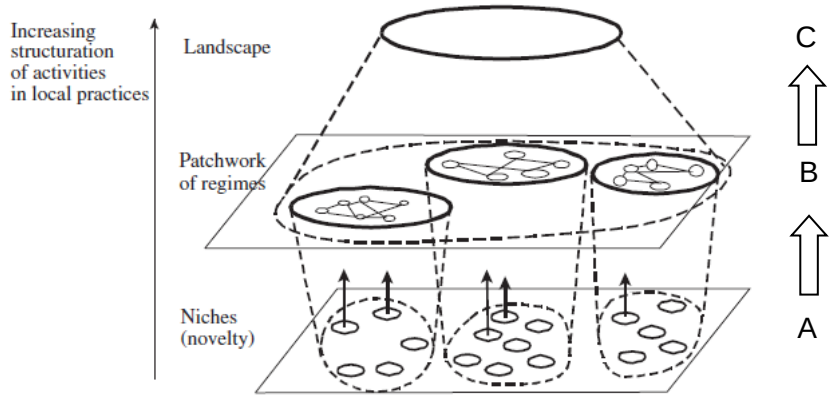

Figure 3.4: Nested hierarchy of multiple nested levels - Source: Geels (2002:1261); Geels (2012:52).

3.3.3 Limitations and criticisms

The literature about the Multi-Level Perspective has recognised several areas of criticism that have been partially reviewed. Three interlinked criticisms are relevant for this research (Geels, 2019): 1) spatial and geographic concerns, 2) the 'provisioning' focus, 3) power relations.

Firstly, the concrete spatialisation of this 'narrative' remains unclear, especially as it has been seen as a universalising theory, despite the arguments that it is a theory that works at global and local level simultaneously (Geels and Schot, 2010). In this regard, Temenos et al. (2017) have criticised the underlying assumptions of the spatialisation of emission reduction initiatives in transport and the outcomes under a neoliberal logic, highlighting the need for a shift beyond technological development and the focus on physical infrastructure and equipment provision.

Secondly, this criticism is clearer when looking at the definition of systems in transition research where MLP is founded. The socio-technical framework to transitions within MLP conceptualise systems (such as transport, food, energy) as a configuration comprised of technology, markets, institutional practices, cultural meanings, scientific knowledge, among the main constitutive elements (Elzen et al., 2004; Geels, 2004; Geels & Schot, 2010a; Geels, 2012). In this regard, Loorbach et al. (2017) discuss systems through three concepts: socio-technical, socio-institutional/economic, and socio-ecological systems. Further, Røpke (2016) had conceptualised four 'societal' basic systems: resource and waste, provisional, distributional and geographical (including jurisdiction and national

economy), posing a critique on MLP for emphasising the transition as a process of provisioning yet not addressing a discussion regarding distributional systems (Ibid).

Geels (2019) has argued that the MLP indeed emphasises socio-technical transition processes with a strong focus on 'provisioning' systems since the focus on 'distributional' systems is limited, which is precisely the critical point of discussion in this research. He continued arguing that emerging research on justice and the distributional consequences of sustainability transitions have gained considerable weight in addressing these concerns (Sheller, 2015; 2018). Indeed, saying less about the distributional issues in a transition process introduces questions regarding who benefits and in what ways, poorly addressed in transition research. Likewise, transition research has been criticised for not addressing concerns about outcomes or impacts in its analysis (Guillard et al., 2016). This critique inevitably draws on the discussion of the emphasis on artefacts, infrastructure and the material dimension, giving rise to concerns over technological developments as universal or ready-made solutions, and ultimately, the transition character, which is a matter of this research.

Third, MLP has given little space to politics, policy and power (Smith and Grin, 2010; Patterson et al., 2017). Docherty et al. (2018) have already discarded the discussion of the actions that the state and the public sector require to change in a transition to a 'Smart Mobility' future (Ibid), since the transition is led by some dominant sectors, and with particular interests (Andion et al., 2012). What is crucial in this regard, however, is the debate on the governance of mobility and how public values and interests are addressed. However, without a clear focus on the distributional and social outcome issues, politics and power remain in a descriptive sphere of institutional and organisational management led by powerful groups (Temenos et al., 2017; Temper et al., 2018). Moreover, MLP could also be biased in decision-making, excluding or rendering certain invisible courses of action (Temenos et al., 2017) or emphasising some aspects of decision-making rather than others.

Furthermore, while looking at the niche-regime-landscape conceptualisations, a certain vertical hierarchy underlines the three levels: the emergence of technological niches and the pressures of the landscape modifying the stability of the regime (Figure 3.2). However, MLP has been precisely criticised for suggesting this hierarchy and lacking mechanisms to contextualise change processes (Shove and Walker, 2010) in particular

if they are led by some dominant sectors. This is particularly relevant, considering that top-down approaches in governance are common in the Global South (Levy, 2013; Moser, 2016), where institutions are often weak and biased, and public goods are disproportionately distributed among very few population groups while others experience disadvantages and exclusion (Janoshka, 2016; Martinez et al., 2018).

One of the crucial aspects before concluding this subchapter is the underlying rationale behind the MLP as missed aspects and critiques which could be partly influenced by the origins, situated in a European – specifically, Dutch context, characterised by an egalitarian ethos as well as a perceived stability and cultural homogenisation, despite the recognition that egalitarianism is less than in the past (Martens, 2017). This national 'rationale' tends to obfuscate differences and similarities between social strata. However, this does not mean that social inequalities in this context do not exist (Kuipers, 2012).

Finally, and returning to the MLP's focus on the provision and its criticism of the lack of discussion of distributional aspects, niche-innovations and its deployment processes indeed generate negative side effects, especially in the first phases of a niche deployment, which is an institutional and governance matter. These negative effects – or dis-benefits - are not only a matter of the result of introducing an untested novelty itself but also pose a challenge and an institutional duty to deliver and look after public value (Docherty et al., 2018) (see Chapter 4). When these negative effects are exacerbated by a rationality of public institutions that does not enable them to be addressed, this is what this thesis calls 'contested' niche-innovations.

Therefore, this thesis places the focus on an early stage of a niche deployment, focusing on how the 'enabling environment' to deploy the BSS in Santiago was created and operated in practice. Thus, significant insight can be obtained in the relational dynamics between the institutional and operational levels to understand if a transition takes place and, if so, the subsequent character. In examining the case study in Santiago, this thesis echoes these critiques by addressing the theoretical bias on users' travel needs and experiences, considering that a mobility justice transition is required, going beyond the assumption that by solving a production and supply problem, social issues are solved (Temenos et al., 2017). Indeed, a 'transition researcher' would have similar biases as conventional transport planners by not addressing the concept of mobility itself (Ibid), where initiatives encouraging cycling or electric vehicles usually pose significant social

challenges in travel needs, thereby disadvantaging particular groups of people. Socio-Technical Transition research has a pending debt with the socio-spatial dimensions of mobility and inequalities (Levy, 2013). In this regard, the limitations that MLP exhibits are addressed in the second part of this chapter with the mobility justice framework discussed below.

3.4 From generic transition to a mobility justice transition

Contributions to the 'automobility in transition' perspective have recognised the dominance of car-based mobility, arguing that transitions to sustainable transport futures "cannot avoid taking automobility into account" (Geels, 2012:xiii).

Sustainable transitions have been discussed as intrinsically linked to a social justice transition (Mullen and Marden, 2016; Sheller, 2018). However, as explained in the previous subchapter, discourses within the Multi-Level Perspective (MLP) continue to detach social justice aspects from sustainable transitions, particularly disregarding the distributional aspects of a niche deployment.

This thesis echoes these concerns arguing that there is a need to develop a comprehensive framework to address multiple concerns to justice to enable sustainable transitions. Indeed, a more comprehensive theory of justice and mobilities is required to address the unsustainable production-consumption patterns as part of the common, everyday phenomenon of uneven mobilities and differentiated accessibility (Levy, 2015; Sheller, 2018).

Significantly, the 'mobility justice' framework echoes these concerns by discussing the movement of people across the city and the difficulties that some groups of people may face regarding accessibility issues to their everyday activities that make up a decent life. Therefore, mobility justice is a theoretical framework that encompasses the power relations among multiple domains of mobility, both the material/spatial dimensions and the institutional rationale and processes that constitute and shape the movements of people across the city.

In addressing the distributive dimension of mobility justice, this thesis argues that it goes beyond the material distribution of goods and its implications for social positions (Young, 1990). Therefore, the focus here is on institutional practices through which unequal conditions are created, affecting the accessibility of different groups of people when deploying a transport innovation.

Therefore, this subsection considers the notion of 'equality' as a high-level priority in addressing the institutional dimension for mobility justice transition research (Harris, 1988, 1997; Cohen, 1989; Sen, 1993; Dworkin, 2000; Mullen, 2009; Mullen et al., 2014). The concept of equality here has its roots in the political philosophy of what kind of society we aspire to? (Crisp and Slote, 1997; MacIntyre, 1982; Sandel, 2013; DFID, 1997; Jones, 2012; Mullen et al., 2014). As such, equality rests on the assumption that people should be 'treated as equals' (Dworkin, 1977:68).

This subchapter is structured as follows to address these concerns, providing a theoretical basis for the critiques of justice of practices and impacts when deploying a niche-innovation in transport. The first part provides a discussion of mobility justice. Then, given the focus on the institutional levels, a critical perspective further discusses the institutional-political dimensions in mobility justice. This perspective is built upon the three principles of social justice: (re)distribution, recognition, and participation to complement the Multi-Level Perspective. Furthermore, the accessibility framework is introduced as a high-level priority in mobility justice, complemented by a brief discussion on data management and protection. Finally, some research related to mobility justice and transport innovation is presented to contextualise the present discussion.

3.4.1 Exploring and defining the concept of mobility justice

Literature in mobility justice comprises a synergistic mixture between political philosophies of justice literature (Martens, 2017, Urry, 2007; Sheller, 2018, 2019; Cook, & Butz, 2018, 2019) and the new mobilities paradigm (Urry, 2007). On the one hand, it is composed of the study of rights, freedoms, capabilities, distribution, among the most relevant concepts of justice (Rawls, 1999; Walzer, 1983; Miller, 1999; among others).

On the other hand, an expanded vision of justice has been added through discussing the fairness of the mobility relations when looking at the contemporary mobile life (Everuss, 2019), questioning ‘’how relations of (im)mobility… are produced within and through social and political practices’’ (Sheller et al., 2018:24)

Mobility justice is an umbrella concept for analysing "how power and inequality inform the governance and control of movement, shaping patterns of unequal mobility and immobility in the movement of people, resources, and information” (Sheller, 2019:23). Thus, this concept stresses the ontology of movements through which inequalities are generated by analysing the movement of people and the difficulties that different social identities may face in accessibility issues to their everyday activities as well as those valued activities that make up a dignified and worthwhile life. In this regard, people’s capacity to move (or stay), around and between spaces is conditioned by different social and cultural constructions of self, such as class, level of education, wealth, or gender (Levy, 2015). Derived from an ‘uneven’ mobility rationale, processes and practices (Mullen and Marden, 2016; Sheller, 2018), this conceptualisation operates at inter-sectorial and multiple scales, ranging from the body to household, community, city, region, nation and the globe (Brenner & Schmid, 2015; Sheller, 2018).

Therefore, the mobility justice framework allows "to show how [uneven (im)mobilities] not only intersect but refract and intensify each other in multiple ways simultaneously" (Sheller, 2019:23). Thus, by linking both the institutional and material/spatial dimensions for an approach to mobility justice regarding the distributive concerns, movements of people are here understood as both ‘’an outcome of political and power relations as well as the institutional processes that constitute and shape them’’ (Everuss, 2019:133).

Accordingly, this thesis considers mobility justice as an open-ended discursive construct made up of a combination of power relations between governing institutions/processes and the spatial/material dimensions of mobility as regards many forms of discrimination and injustices that reproduce and deepen urban inequalities. Thus, while the spatial/material dimensions of mobility are an expression of different dynamics of exchanges and values, institutions are seen here as “more than just agencies: institutions are also ‘rules of engagement’, which embed power and decision-making processes” (Frediani et al.,2020:10).

Therefore, an approach to the distributive sphere requires a recognition of people's differing needs, based on the assumption that each person matters (Mullen et al., 2014). By questioning the "the why (the public policy function), the what (the rules of the game), the who (the networks of actors and their position, power and objectives [as well as who receives social welfare]) and how (the way in which the public is involved and how accountability and transparency are maintained)" (Docherty et al., 2018:117-118), three principles of social justice are intersected to create an approach towards mobility justice transition research.

3.4.2 Principles for research in mobility justice transition

Building on the social justice debates between Young (1990, 1998), Fraser (1996, 1998a, 1998b) and Levy (2015) on transport and the just city, this thesis considers three interconnected mobility justice principles: (re)distribution, recognition, and participation.

Debates in the distributive sphere of justice have posed different questions on the ontology of distribution. One line of discussion stresses the distribution of goods by questioning what transport goods and services are planned and how they are located, how they are distributed and among whom (Walzer, 1983).

However, Young (1990) has questioned distributive perspectives based on the allocation of goods and the distribution of social positions, arguing they ignore the institutional contexts in which distribution occurs. Under this perspective, institutional contexts are considered as "any structure or practice, the rules and norms that guide them, and the language and symbols that mediate social interactions within them, in the institutions of the state, the family, and civil society, as well as in the workplace" (Young, 1990:22). She, therefore, broadened the scope of distributive justice by addressing concerns over decision-making processes by arguing that many activities of people are the result of processes and relationships based on beliefs, ideologies and values. In this sense, she expanded the discussion by stating that the mechanism that produces injustice is the institutional structure, posing questions over the extent to which the institutional levels affect the travel experiences.

Levy (2015:2) further developed the concept of (re)distribution, linking (conventional) transport planning and urban equality. She defines (re)distribution as a macro-level material-spatial sphere "embedded in a relationship between social identity, urbanisation and capitalist development". In this regard, she argues a differential access to and control over resources with a spatial urban expression in the interaction between transport, land uses and land markets.

Likewise, Sheller (2018:14) defines mobility justice as ‘multi-scaler’ and an inter-sectional process comprising the distributive perspective: “from micro-level embodied interpersonal relations to meso-level issues of urban transportation justice and the “right to the city,” to macro-level transnational relations of travel and borders, and ultimately global resource flows and energy circulation”. These aspects expressed by Sheller take into account the mobility regimes in reference to "a specific set of principles, norms and rules that govern the mobility practice" (Kesselring, 2015:576), informing about an unequal stable pattern, as an expression of beliefs, practices, and traditions (Rhodes, 2007; Kesselring and Volg, 2013).

Therefore, these outlined approaches to the distributive spheres in mobility expressed by Young (1990), Levy (2015) and Sheller (2018) make it possible to create links between the social justice dimension and the Multi-Level Perspective to address mobility justice transition research. In particular, these perspectives are relevant when observing that the physical movements across the city are governed by certain rationality influencing who is allowed and able to move, how, and under what conditions (Kesselring, 2015; Sheller, 2018), marginalising the improvement of the quality of life of some groups of people (Ohnmacht et al., 2009; Lucas, 2012; Levy, 2013).

Connectedly to the principle of (re)distribution, recognition refers here to a relationship between the recognition (or misrecognition) of social "differences in the conceptual frames of institutional practices" (Levy, 2015:3) and its influence on differential access to and control over resources.

In this regard, this thesis takes into account the integrated vision between technology and society (Bijker et al., 1987) that the MLP offers, under the understanding that socio-technical changes are a social construct. Rooted in the Sociology of Technology in Transition Studies, this perspective emphasises the link between technological developments and local practices to understand the relationship between different actors,

alignments and perceptions, comprising different and heterogenic resources, capacities and elements (e.g. knowledge, regulation). Further, the notion of ‘social construction’ deals with how different actors (e.g. citizens, scholars, practitioners and institutions) interpret the world, stressing the idea that the knowledge/understanding of the world might differ according to class, race, gender, culture. However, this may also constitute significant biases in how people's movements are understood at the institutional level.

Therefore, this line of argumentation helps to understand that socio-technical changes are constituted by a dynamic process of constructing values and meanings which has a spatial/material expression, comprising different stages, levels, and domains, or what is so-called the ‘social construction’ of technological developments (ibid). Therefore, how public and private values are addressed becomes crucial.

Likewise, a critical recognition element relates to personal data as a crucial asset for systems operation and key input to match the demand and the ‘spatial/material’ dimension, making it the most valuable commodity. In other words, personal data is recognised as “the knowledge upon which the power to control the marketplace is built" (Docherty et al., 2018:121). This is so when looking at the key building blocks of an emerging deployment. Based on the ideas of ‘smart mobility’ (ibid), there is a novel marketplace of mobility based on on-demand service users, automatic payment systems, crowdsourced, user-centric, real-time new information as well as smart' infrastructure and equipment based on new user information to influence behaviours and optimise system performance (Alam et al., 2016). It also includes the marketplace modelling, where "all users being accepting of sharing which is imposed upon them by a system manager" (Docherty et al., 2018:119). However, this approach in ‘smart mobilities’ introduces significant institutional challenges in terms of recognition, particularly regarding the access to and control over personal data as these data are given to private interests. In this sense, a deregulated institutional context may be subject to an asymmetry of information that makes it difficult to prevent potential harm, exposing travellers of these systems to a vulnerable position regarding the control of their personal data. Indeed, relevant for the present discussion is the type of governance we are looking at and the ideology to which they subscribe, as the governance system can exacerbate or mitigate injustices through investment decisions (ibid).

Regarding the principle of participation, Fraser (2009:16) has discussed justice as participation parity: “justice requires social arrangements that permit all to “participate as peers in social life". Levy (2015) further discussed participation in transport planning as parity political participation in transport planning, referring to both the right to participate in transport planning decisions in reference to medium and long-term impacts on the spatial/material dimensions of mobility, therefore allowing changes to improve people’s travel experiences.

This thesis considers the principle of participation from an institutional point of view, dismantling first the institutional rationale, configuration and practices that prevent some people from participating on a par with others to understand how institutions work as well as how change can be guided. In other words, this principle refers here to who and how key actors are being recognised and integrated into the processes that trigger change, as well as who has effective decision-making power and how it is exercised. Therefore, the analysis of embedded strategies in the deployment of emerging mobilities can help to address the study of institutional changes towards mobility justice scenarios.

This subsection explored each principle to expand the account of mobility justice, providing a theoretical basis for the critiques of justice of capabilities, practices and impacts in light of the case study.

3.4.3 Mobility Justice Transition research

This thesis argues that the achievement of mobility justice is through processes in which inequalities and patterns of urban segregation can be challenged. As seen in Transition Theories and the Multi-Level Perspective, a technological deployment faces different phases that account for a process of change. In this regard, this thesis emphasises on an initial transition pathway referred to the existence of transformative adaptation or adaptive strategies triggering processes of change and simultaneously creating and/or accommodating alternative systems (Patterson et al., 2017).

The emphasis of paying attention at an early stage of change lies in the relevance of the drivers of change at the institutional level, as social justice principles may not be as

explicit or aligned and therefore require to be observed and analysed at their genesis. Thus, the institutional rationale, the constitutive set of values and meanings underlying a technological deployment, the institutions contexts and their decision-making scenarios can shed light on what to consider and how to trace a transition pathway towards mobility justice. Therefore, this thesis explores retrospectively the existence of transformative strategies that boost processes of social change and thus complement interventionist research.

In this regard, Frediani and colleagues (2020:10) have argued that a relevant intervention in urban equality relates "to change the way in which institutions work". Therefore, "if research projects seek to bring about some sort of change to advance urban equality, they have to be able to impact institutions - local and national governments, the private sector, NGOs, community organisations and international bodies – and the broader set of institutional arrangements and relationships that govern them" (ibid:4).

To develop a mobility justice transition research, the understanding of how movements supported by a new technological deployment are understood, allowed, and controlled is here addressed through the concept of accessibility as a high-level priority in mobility justice concerns, considered central to distributional issues (Mullen et al., 2014; Martens, 2012; 2017). A perspective of equal concerns on data management and protection is briefly introduced to complement the accessibility framework.

3.4.3.1 Accessibility framework

Mullen et al. (2014) have pointed out two high-level priorities in transport planning to launch the discussion: i) Reducing transport-related deaths to the minimum (i.e. from collision, pollution, climate change, or lack of transport), recognising the right to an equal safety in order to tackle inequalities in exposure to risk, and ii) recognising the people's right to have access to some form of effective means of transport. Thus, while the first priority relates to protecting life, the second refers to having access to effective means of transport in order to access the goods, services and activities that make up a decent life.

Accessibility has been defined as the potential of opportunities for interaction (Hansen, 1959). As a potential matter, the accessibility level that a person could experience is

determined by the spatial distribution of activities, the available transport system, and a person's ability or capacity to overcome spatial separation. Thus, since different groups of people have different resources and capabilities, limitations, impediments, constraints, opportunities, the perception of the benefits of transport can all be understood through the accessibility framework (Rimmer, 1985; Martens, 2012, 2017; Levy, 2013; Moser, 2016).

Martens (2012) has noted that the social meaning of transport goods is best reflected by analysing accessibility. Indeed, the concept of accessibility has also been described as a social meaning for transport, having a lot to do with how people relate to it by considering not only the possibility of moving across the city but to reach the activities that people value as important (Martens, 2012; Grengs, 2015). Regarding the progress that the concept of accessibility has achieved in including the social dimensions of transport, Geurs & Van Wee (2004:208) linked transport systems and land use combined by impedance and opportunities, defining accessibility as "the extent to which land-use and transport systems enable (groups of) individuals to reach activities or destinations by means of a (combination of) transport mode(s)". Bocarejo and Oviedo (2012:143) included subjective aspects and the idea of potential movements, or "the ease of reaching desired destinations given a number of available opportunities and intrinsic impedance to the resources used to travel from the origin to the destination" as one of the latest definitions. Everyday activities are considered behind this conceptualisation to understand different social identities and positions of users, as well as their transport and spatial needs.

Accessibility, as a social need, relates to the spatial and material dimensions of mobility such as jobs, public services like health, education, housing, transport, formal and informal institutions, as well as community relationships, through transport systems (Martens, 2017), in line with how Mullen et al. (2014) refer to an equal concern. So different groups of people have the possibility to participate in urban activities, reaching activities that generate and require particular assets (Levy 2013). In this regard, accessibility is seen in this research as a public value that should be addressed and maximised to access the things that make up a decent life (Beyazit, 2011; Mullen et al., 2014; Levy; 2013; Martens, 2012:2017; Hrelja et al., 2018). However, the different access to and control over resources that some groups of people experience in their daily life is crucial to understanding accessibility. Inequalities have spatial, economic, social and

political dimensions that make it possible to detect unequal accessibility levels as a consequence of a given transport-planning rationale (Bocarejo and Oviedo, 2012, Harvey, 1990; Martens, 2017).

Accessibility reformulates the concept of travel pattern, further discussed through the concepts of ‘actual’ and ‘perceived’ accessibility. On the one hand, Lucas (2012) identified the following dimensions of actual accessibility that diverse groups of people have: (i) individual dimension, reflecting needs and opportunities based on people’s gender, income, age, travel budget, educational level, among the main personal characteristics; (ii) land use dimension, reflecting the spatial structure of cities and their processes of contemporary urban development, including the built environment, land market, among others; (iii) transport systems dimension, in relation to the available means of transport to accessing activities; (iv) temporal dimension, related to constraints, in terms of time budget, schedules, costs, in a particular cultural context; and (v) cognitive dimension, or the physical and mental ability to access the transport system.

On the other hand, ´perceived accessibility´ is defined as how easy it is to live a satisfactory life using the transport system (Lattman et al., 2016; 2018). Furthermore, it has been recognised that accessibility to important activities impacts subjective well-being or quality of life (Olsson et al., 2013; Parkhurst & Meek, 2014). Linking actual accessibility and perceived accessibility, accessibility is defined here as the ease of performing a frequent activity using the BSS compared to the previously used means of transport. It implies understanding the perceived interaction between the city and the possibilities and capabilities to carry out day-to-day activities.

3.4.3.2 Data management and protection

A less explored aspect of accessibility relates to the perception of different restrictions and limitations in terms of access and control of personal data and information in technological innovations in transport, which can lead to scenarios of vulnerability, exploitation and even exclusion. In the context of the priorities explored by Mullen et al. (2014) and Mullen and Marsden (2016) with respect to accessibility and security factors as high-level priorities in transport planning, the discussion here is expanded through the principle of recognition and possible risks associated with an asymmetric position of travellers to access to and exert control over their personal data (see for example Verma and Rubin, 2018; Eubanks, 2018; Sheller, 2018; Zuboff, 2019).

Kazim and Koshiyama (2019) have discussed issues of justice and fairness as one of the major themes in technology and ethics. Two considerations are relevant here when discussing mobility justice and accessibility. The first consideration relates to the notion of privacy, based on a "public and political demand to respect a human's personal information" (Ibid:12). In other words, these authors stress the role of the public-political sphere with respect to the demand for private-personal data. However, in more neoliberal market-driven contexts, the state has shifted its position as the main source of knowledge about travel patterns, making the governance of mobility a private sector practice despite the efforts made through open data sources. Likewise, another crucial aspect of privacy relates to informed consent, which informs and requests permission to store and use personal data for particular purposes. However, debates relate to the value associated with personal data for economic and financial purposes that certain stakeholders have over them (Mittelstadt, 2017).

In this regard, Kazim and Koshiyama (2019:13) have recognised the existence of institutional biases, referring to a "preferential or discriminatory treatment of persons or groups illustrating that biases may be present". It relates, for example, to historical datasets, which could influence the treatment of certain groups of people regarding the service quality, as well as dominant practices, for instance, regarding pricing. In this sense, it would be a matter of discrimination, in access as well as treatment (e.g. if an artificial intelligence service only recognises male voices), or as a consequence of its design (Lipton et al., 2018). However, these factors are often interconnected in practice. Despite the extensive literature on technology and the discussion on ethics and governance, I limit the attention to some broad points to complement the mobility justice discussion of Mullen et al. (2014) and Mullen et al. (2016) and equal concerns for accessibility.

Thus, while the discourse on digital ethics is geared towards the mitigation of potential harms, this literature undoubtedly encourages their standardisation. Dwork et al. (2011) and Lipton et al. (2018) have stressed the rationale of accessibility of new technologies in terms of 'equal access', aside from affordability and user-friendly. In this regard, technological developments remain unclear regarding how society is viewed and treated. This thesis discusses the rationale of 'equal access', highlighting the difference between equal access and equal treatments, considering that the latter requires taking account of people's differing needs, institutional contexts and governances (Dworkin et al., 2011).

Thus, this perspective leads us ultimately to the question: what kind of society are we envisioning, and what kind of relationships are we creating when deploying a niche-innovation?

Due to its universalising stance on mobility, technological determinism, and an independent logic of social dimensions, this novel mobility marketplace also reflects unfair and biased institutional and organisational practices. Therefore, the mobility justice framework offers an opportunity to address the ethical and philosophical questions of how technology and society relate to each other. The debate in this regard has just opened up, challenging us to continue to discuss the responsibility that a few take on the provision of new transport services. Citizens must have the right to effective and secure access to these new systems (Mullen et al., 2014; Mullen et al., 2016).

3.4.4 Mobility justice framework and niche-innovations in transport

Over the last few years, a committed research effort has focused on niche-innovations in transport, addressing concerns about low-carbon transitions and sustainable mobility (O' Tuama, 2015, Meelen et al., 2019). While recognising the undoubted importance of environmental concerns in the attempt to influence current mobility discourses and practices (Temenos et al., 2017), an interdisciplinary approach discussing the institutional and social challenges that a sustainable mobility transition require is still sparse (Stanley et al., 2011, Martens et al., 2012, Mullen et al., 2014; Schwanen et al., 2015). However, literature on emerging mobilities, particularly Bicycle Sharing Systems, has not said much about mobility justice principles and the links between governance and institutional dimensions, as its focus remains on technology as the object of study. Yet, there are some attempts to address concerns of mobility justice.

For example, in the case of the London Bicycle Sharing System (LBSS), Goodman and Cheshire (2014) showed inequalities related to location, socio-economic and gender-related features that turned into a non-inclusive initiative catering to the advantaged-white-male population (Goodman and Cheshire, 2014). Nevertheless, findings showed that registered users in deprived areas used the system more when extended outside central London. In fact, the proportion of registered users from deprived areas doubled

the percentages of the total number of users from 6% to 12%. However, the proportion of these trips was far lower than the trips made in affluent areas. Also, women represent a small minority of users of the scheme, under 20% (Goodman and Cheshire, 2014).

Moreover, although there is evidence pointing out that the BSS has the potential to be inclusive (Clark and Curl, 2016), it has become clear that efforts to deploy a BSS are addressing the movements of certain groups of people. Barriers to access based on social characteristics such as class, race, income or education have also been demonstrated (Fishman et al., 2013, 2016; McNeil et al., 2017). Thus, while white, young middle-class men are most privileged in this regard (Goodman, 2015), other groups have remained disproportionally under-represented or directly ignored as no clear strategy of inclusion in the medium and long term could be perceived for them in these deployments. Durán et al. (2019) have been studying governance issues in the Latin- American context, yet governance dimensions in BSS decisions are still considered at a descriptive level and scarcely addressed. As such, a number of central social challenges identified during the early days of BSS are still to be addressed (Fishman et al., 2012; Saud and Thomopoulos, 2021).

To conclude, the mobility justice framework has provided significant insights, principles and elements to combine with the Multi-Level Perspective and thus conduct a mobility justice transition research. However, it requires explicit and well-framed analytical tools, particularly in the Global South. Chapter 4 provides an analytical framework on the functioning of institutions through the New Institutional Economics (NIE) framework. This perspective allows the creation of linkages between the institutional and operational levels, focusing on a decision-making process and issues 'around the state' concerning novel partnerships designs and practices (Carroll, 2012). This is particularly relevant when examining the hybrid governance in such technological deployments, meaning that some sectors of the economy and global corporations dominate technological and industrial deployments. To address the complexities, contradictions and synergies comprised in such contexts, it requires an adequate analytical framework to examine the existence of drivers of change towards mobility justice.

Chapter 4. Institutional analysis for a research on mobility justice transition

This analytical chapter addresses the initial complexities facing the first inter-*comunal* BSS during its process of deployment. Considering the case of Santiago, the regional authority promoted a joint public tender between municipalities with a private sector company within a framework that can be understood within the broad framework of the New Institutional Economics (NIE). Novel organisational forms of governance and contractual practices are considered in this chapter as examples of institutional and organisational complexities when deploying the BSS in Santiago, having a direct influence on the perception of the benefits.

This chapter comprises two phases. The first part of this chapter (Phase I) seeks to provide an analytical framework to help a better understanding of the construction of an 'enabling environment' in which Santiago's BSS was deployed and the conditions under which it might lead to a mobility justice transition towards more inclusive and equal transport landscapes. Phase I examines the analytical elements needed to approach the process of BSS deployment within an institutional and organisational perspective, considering both synergetic and collaborative alignments alongside asymmetries in power and motivational and informational issues that might have influenced the reproduction of socio-economic inequalities in Santiago. Hence, studying decision-making scenarios becomes relevant in this research, as actors relate in a given institutional environment within a particular dynamic interaction that shapes their actions as well as adapting their characteristics when undertaking new relational scenarios (Canitez, 2019). As a relevant component of transition literature (Chapter 3) NIE framework comprises a range of perspectives that contribute to building up an analytical framework on mobility justice transition. Selected literature on NIE for this research are: business model innovation, contracting enabling collaboration, polycentricity and the Social Stratification and Government Inequalities (SSGI) thesis (Ostrom, 1983) to contextualise the socio-spatial inequalities in Santiago.

The second part of the present chapter summarises the key concepts derived from the theoretical (Chapter 3) and the analytical framework to guide the analysis with the empirical information arising from the deployment of the first inter-*comunal* BSS in Santiago in Chapter 6,7 and 8.

4.1 An institutional analysis for niche-innovations deployments: the New Institutional Economics (NIE) perspective

The analytical perspective in this research combines three 'approaches' to analyse the institutional environment or 'arenas' derived from an NIE perspective.

Firstly, Transaction Cost Economics (TCE) framework provides relevant insights into transactions taking place between public transport operators and authorities (Canitez, 2019:521) such as that developed within the first Inter-*comunal* BSS in Santiago (see Chapter 6). However, and in line with the research aims, this thesis does not attempt to analyse efficiency on transactions typically associated with TCE research (Williamson, 1991; 1997; 1998), but rather seeks to analyse the rationale of a potential transaction. It is worth considering that prior information could take a hybrid form. In a market-led governance context such as Santiago, public information relating to feasibility studies could also include business models as a tool of planning to guide future transactions deploying niche-innovations. A business model innovation framework indeed relates to TCE according to "the ways in which the transactions of the organisations are carried out, that are market, hierarchy or hybrid form" (Moreira de Oliveira et al., 2018:42). Here, the focus is placed on the assumptions that underpin public and economic values and principles embedded in the public information that triggered the deployment of the first inter-*comunal* BSS in Santiago, and the role that the regional business model plays in a mobility justice transition (van Waes et al., 2018). Furthermore, as a tool to set the rules of the game, a business model for an intervention such as the BSS in Santiago offers an orchestration scenario between the regulative, normative, and cultural-cognitive actors guided by values, shared beliefs and assumptions (Geels, 2004, Raven et al., 2017) all together providing a certain degree of legitimacy.

Secondly, debates about the metropolitan organisation are discussed through the lens of the Social Stratification and Government Inequality (SSGI) thesis (Ostrom, 1983) to

contextualise the socio-spatial inequalities in Santiago. This is framed within the notion of 'polycentricity' in reference to *comunas* as the basic 'semi-autonomous units of decision-making' (Oakerson and Parks, 2011). This highlights the institutional capabilities to create inter-governmental patterns of collaboration to face socio-spatial segregation.

Thirdly, contractual agreements both in the design and management process introduce significant institutional and social challenges, particularly with reference to the rationale behind 'self-interested' issues between different actors involved in the BSS deployment. From the literature on NIE, contracts can be imperfect, incomplete or ambiguous (Williamson, 2000). Therefore, the assumptions made in collaborative and flexible arrangements can also introduce important biases by leaving out important factors. This research highlights the relevance of ongoing learning process over signed contracts to deploy the first inter-*comunal* BSS in Santiago towards more relational and collaborative schemes, and thereby explores trust-building processes as the basis of 'trusting partnerships' (Hrelja et al., 2018).

This thesis argues that inter-governmental agreements can help to address socio-spatial inequalities. However, collaboration within the institutional and organisational 'arena' deploying the BSS in Santiago is subject to motivational and informational problems that may have an influence on the reproduction of inequalities. From the institutional and organisational side, corporate responsible sustainability and the 'paradox framework' help to unfold such problems concomitantly with the synergies that characterise the inter-governmental agreement. At the end of this chapter, the analytical model summarises key principles developed in Chapter 3 and in the first part of the present chapter.

4.2 Business Model Innovation

As previously mentioned, public information related to feasibility studies as early decisions to deploy the BSS in Santiago included business models as a tool of planning. Therefore, this thesis discusses business models developed by an 'enabling state' that is, a state action "just enabling the opening up of markets" (Docherty et al., 2018:117) under market-led governances to reveal the way in which public and economic values and the underlying assumptions were formulated by this tool of planning.

Shafer et al. (2005) define a business model as a representation of the underlying structure of a firm, comprised by selected strategies for creating and capturing economic values which are embedded in a given support network. Osterwalder and Pigneur (2010:14) explain business models as "the rationale of how an organisation creates, delivers, and captures value" as three fundamental building blocks or major components for a business proposal: i) value proposition, ii) value creation, and iii) value capture. While value proposition refers to a particular value comprised in goods or services offered, value creation relates to the way in which a firm creates and delivers a particular value to consumers. Value capture comprises the way in which a revenue stream and cost structure are assembled in the goods or services offered (Bocken et al., 2014).

According to Boons and Lüdeke-Freund (2013), value proposition defines or redefines values as an exchange relationship of value between a related group of people and organisations, governance and institutions in charge, providing environmental and social values associated in conjunction with economic ones. Value creation positions the institutions/organisation in a large system context in an attempt to equalise the distribution of cost and benefits among all actors whilst also taking into account environmental and social impacts (Boons et al., 2013).

When referring to innovation, business models relate to a form or process of renewal, improvement or change in both organisational and institutional practices and/or by technological niches (see Chapter 3). From a perspective of sustainability, business model innovations comprise both changes in the way an organisation creates and/or reorganises its activities and purposes (Bocken et al., 2014), including outsourcing practices towards sustainability. However, little has been said in the literature of business models about addressing 'public values', as a matter of governance. Bozeman (2007:17) defines public values as "(1) the rights, benefits, and prerogatives to which citizens should (and should not) be entitled; (2) the obligations of citizens to society, the state, and one another; and (3) the principles on which governments and policies should be based". Bryson et al. (2014:446) explain that the main role of the state is nowadays to ensure that public values agreed in "broadly inclusive dialogue and deliberation", understood in relation to the fundamental goals agreed by a society, which includes the actions of non-governmental bodies as well as a private business.

Similarly, Rauschmayer et al. (2015) argue that in the absence of clear normative rules in interventions to trigger transitions to sustainability, there are doubts about the achievement of the promised goals and objectives.

4.2.1 Business model innovation in bike-sharing: a niche-innovation in transport

Business model innovation in BSS has been recognised as a niche-innovation by transition scholars (Geels, 2019). van Waes et al. (2018) have argued that the emergence of these business models has positioned the BSS as a part of urban mobility transition by effectively incorporating a bicycle as a transport alternative within formal transport services.

Currently, it is possible to recognise a variety of bike-sharing niche types, depending on its technological development. Analytically and for urban transport purposes, these systems can be distinguished into two categories: between return trips and single trips. While the first comprises a system station based on collecting and returning a bicycle, the second consists of a system that allows collecting and returning the bicycle everywhere, as a free-floating system. Recently, a peer-to-peer system emerged, in particular in the Dutch context, where people rent out their own bikes; however, these systems have not been as popular as the two previous ones (van Wees et al., 2018).

In terms of value proposition, these systems have been conventionally deployed to resolve the so-called ‘last-mile’ problem, referring to this as the last part of a journey of people from the formal transport systems to their final destinations (Adnan et al., 2019), in particular in the busiest areas of a city. However, these systems can also have touristic purposes, including offering local mobility options. As a public transport policy matter, Rojas-Rueda et al. (2013) and Woodcock et al. (2014) highlight the importance of a BSS to facilitate short term bicycle trips in urban areas, in the light of the social and environmental benefits that the literature has shown, such as improving health (Woodcock et al., 2014) and potentially, accessibility (Clark and Curl, 2016) through its adoption (see also Chapter 3).

Value creation and capture relate to the profit and resource formula to deliver the value proposition, commonly comprising a membership scheme, advertising and branding formulas, or governmental subsidies, in both for-profit and non-profit modalities (DeMaio, 2009; Shaheen et al., 2010). Key processes for delivering a value proposition relate to the operation and maintenance of the system, which comprise payment and access system, travel records, fleet management, maintenance, payment, vandalism and customer service satisfaction (Crutchley and Kubitz, 2019; Nikitas, 2019), as well as the distribution of bicycles.

However, as an institutional and organisational matter, there is a need to review these BSS business models, as several of the key challenges identified during the early days of BSSs (Fishman et al., 2012) have yet to be addressed. Thus, social and governance challenges need to be rethought in order to reconcile the value formulas in business models between public and private objectives (Backhaus et al., 2019; Signor et al., 2019). This is because business models comprise several assumptions about the principles underpinning their values, which can introduce significant institutional biases and impact how these services are planned and performed in practice. Moreover, discussion in business models seems to be static on the main pillars of value proposition, creation and capture, not yet addressing public values as a core societal issue, particularly regarding transport needs.

In value proposition terms, spatial coverage implies both the system size and location of stations, considering a docking bike-sharing scheme as in the case study in Santiago. In this regard, it has been said that system density influences adoption and usage (Shaheen et al., 2012; Fishman et al., 2014) in conjunction with the presence of some attributes of public space to encourage cycling (Saud, 2014; Rosetti et al., 2019), which are both a matter of the system purpose and its distributive dimensions across the city. For example, in the case of the inter-*comunal* BSS in Santiago, its size and location as relevant variables were defined in support of current transport demand in the busiest areas of the city. However, travel needs in Santiago and new demands were not explicitly addressed in the business model. Spatial coverage of a BSS is a crucial matter, enabling the examination of assumptions made regarding the definition of for whom such a system is aimed. Indeed, and typically in business model designs, a company would proceed by ’stratifying’ or 'segmenting' groups of people with similar needs to define a value proposition. That is, a group is a subject of targeting for the delivery of such values. The

sensitivity of these considerations lies in the way in which needs are considered, to whom they are addressed and the assumptions underlying a business model.

In terms of the key process related to value creation and capture to deploy a BSS, an extensive body of literature has discussed the rebalancing problem in dock-station based systems (Erdogan, et al., 2015; Laporte et al., 2015; Sari, 2015). A crucial problem for operators is to maintain a well-balanced number of bikes in stations. Hence it implies a logistical dimension in the fleet distribution that could have an impact on travel patterns resulting from managerial decisions, especially within flexible contracting schemes. Furthermore, this problem also leads to modifications of the system, for example, mixing between manual and automated systems, as logistics are ultimately among the costliest aspects of these systems, which could have a strong impact on the user's perception of benefits.

The connections between value proposition, creation and capture in terms of decision-making processes have been little explored in relation to technological innovations such as a BSS (Boons and Lüdeke-Freund, 2013). This is particularly relevant when looking at the institutional/organisational agreements and the degree of alignment towards common purposes, which is crucial to unfold the rationale underlying these innovative transport deployments. Therefore, links between a business model and a tendering process are relevant for an in-depth discussion of the institutional implications within a framework of mobility justice.

4.2.2 The role of a business model in a transition process

To understand the role of a business model in a transition process and how it influences the trajectory towards mobility justice, three functions of this planning tool are considered in this research (Bidmon and Knab, 2018):

a) *As an industry recipe*. It refers to a working hypothesis or an industry formula that has persisted over time. It is a dominant model which represents a particular organisational modus operandi (Chesbrough, 2010; Bohnsack et al., 2014) embedded in a dominant industry logic (Bettis and Prahalad, 1995). Thus, this type of business model provides an understanding of how organisations operate,

guiding decisions on how to create and capture most effective value for organisations and institutions around the industry.

b) *As a mechanism to commercialise technology:* this type of business model seeks to link new technologies with a high commercial business impact (Chesbrough, 2010; Teece, 2010; Zott et al., 2011), providing the required context and scope by composing specifics values to enter the market. In doing so, technological niches can be based on existing types of business models or by developing a new formula (Chesbrough, 2010).

c) *Subject to innovation itself:* This role relates to a novel business model with the potential to disrupt industries (Mitchell and Coles, 2003), redefining the way in which organisations and institutions deliver values to people independently of the technology itself (Casadesus-Masanell and Ricart, 2010; Zott et al., 2011). Novel business models can also be technology-generated or technology-driven (Velamuri et al., 2013).

However, within transition research, it has been argued that, in the absence of political, regulatory and market changes, a business model innovation lacks sufficient capacity itself to trigger effective processes of changes (Bolton and Hannon, 2016). This is particularly relevant in early decisions deploying niche-innovations in transport. For example, in the case of Santiago, the business model mainly focused on increasing the return problem disregarding a broader governance discussion about travel needs and the high socio-spatial inequality that affects Chile. In this regard, Docherty et al. (2018:116) state that the rationale for a public value-driven governance intervention is to work on the opportunities offered by "a particular socio-technical mobility transition to (a) maximise the benefits that mobility brings to people" … "(b) manage the distribution of these improved mobility opportunities according to democratically agreed objectives on equalities and social justice, and (c) to do so within the framework of international agreements about reducing the impact of mobility on the environment, and particularly with regard to decarbonisation".

What is crucial in this thesis is understanding who and how key partners are recognised and embedded in a particular partnership design deploying a transport innovation at the regional scale. Stadtler (2018) analyses the collaborative partnership between businesses, companies and civil society to provide public goods and services which effectively enhance common interest towards delivering the expected social outcomes.

Hrelja et al. (2018) argue the need to build new forms of control and governance based on the trust-building process as the basis of 'trusting partnerships'. Saud and Thomopoulos (2021) stress the need for better alignment between the key partners towards pursuing societal objectives such as accessibility and equity. The main definitions, components and the role of the business model in a socio-technical transition have been described in this sub-chapter. However, in the absence of political governance and institutional discussion to address the kind of social concerns posed here, there remains a disconnection with socio-spatial concerns, an issue addressed in the next subsection, followed by assembling these as an analytical framework at the end of the chapter.

4.3 Socio-spatial inequalities: an institutional approach from the perspective of polycentricity

Debates in a metropolitan organisation are discussed through the polycentricity perspective in reference to the notion of units of decision-making with some degree of autonomy and independent from one another and their capacity to create inter-governmental agreements. This highlights their relevance in facing the socio-spatial segregation that affects Santiago.

Polycentricity is broadly rooted in the New Institutional Economics (NIE) framework, in particular based on the work of Vincent and Elinor Ostrom, in reference to socio-spatial segregation and collaboration as a matter of decision-making (Andersson and Ostrom, 2008; Galaz et al., 2012; Bixler, 2014; Carlisle and Gruby, 2019). Polycentricity in this research is relevant to highlight the inter-governmental agreements which gave rise to the first inter-*comunal* BSS in Santiago.

Ostrom et al. (1961) defined polycentricity as a metropolitan-area governance system characterised by multiple political units of decision-making. Oakerson and Parks (2011:153) discussed polycentricity as a model of governance structure, which describes a process of decision-making "where multiple independent actors interact to produce an outcome that is commonly valued" in contrast to 'monocentricity', whereby a single centre concentrates the power of decision-making. A polycentric structure comprises two conditions: the existence of multiple centres of local authority and partial dependency on

higher levels of governance, or what these latter authors called ‘semi-autonomous units of decision-making’ (Ibid). This perspective considers the production and provision of public goods and services discussed as a dynamic to enforce the rules for the provision and production to occur. This allows an open governance structure for non-governmental actors to enter into the side of production, delivering benefits to the community.

What is highlighted here is the possibility of an institutional environment able to create and/or modify the pattern of provision and production, which is possible by local governments setting the rules of the game, but also by a partnership capability, or the way in which local governments create and adjust their revenue collections to make agreements with other institutions and organisations (Ibid).

Relevant for research in polycentricity are the two attributes comprised in a polycentric governance system (Carlisle and Gruby, 2019; Kübler and Rochat, 2019):

i) units of decision-making with some degree of autonomy and independent of one another
ii) a capacity to establish relationships between the units, considering the role of inter-governmental collaboration in facing patterns of socio-spatial segregation.

Semi-autonomous units of decision-making, in the context of the notion of ‘polycentricity’, refer to both formal and informal institutions with the capacity to make and manage “norms and rules within a specific domain” (E. Ostrom, 1999:552). The semi-autonomous units of decision-making could operate taking “into account in competitive relationships, enter into various contractual and cooperative undertakings or have recourse to central mechanisms to resolve conflicts” (V. Ostrom et al., 1961:831).

This research focuses on sub-national administrative ‘divisions’ in Chile (see Chapter 5). The semi-autonomous units of decision-making refer to *comunas* as administrative units able to exercise “considerable independence to make norms and rules within a specific domain” as decision-making centres (E. Ostrom, 1999:552). To contextualise the discussion in Santiago, it is worth noting that local governments although having a functional territorial autonomy to provide basic public services at the local level, such as

health or education, in practice many of them barely have the resources to make these services available (Du Plessis, 2020), either differing substantially in quality compared to others or compared to the fully private provision (see Chapter 5).

This conceptualisation was adopted and adapted here to create an analytical approach towards social-spatial inequality that affects Santiago. Considering the research subject on decision-making processes, the conceptualisation on semi-autonomous units is complemented with the social stratification and government inequalities (SSGI) (Ostrom, 1983) as institutional practices in segregation. The rationale for doing so is to place the focus on the institutional and organisational arenas when creating an 'enabling environment' to deploy the BSS in Santiago, highlighting the different capabilities of local governments to provide basic services.

4.3.1 The social stratification and government inequalities (SSGI) thesis

The SSGI thesis helps to provide an understanding of the role of the inter-governmental agreement to deploy the BSS in Santiago in both fostering or hindering socio-spatial inequalities. The present discussion is illustrated through the collaborative agreement that took place between 11 *comunas* in Santiago, further analysed in Chapters 6 and 7.

The SSGI thesis explains the existence of institutional arrangements oriented towards wealthy residents, which implies socio-spatial segregation associated with the distribution of public goods and services. Ostrom expresses her concerns on particular institutional arrangements whereby some groups of people and firms might exercise control over access to land and resources for their own short-term purposes, shielding themselves and their residential areas from potential low-income residents, thus affecting the burden of public services and perpetuating inequalities across a metropolitan area (Hill, 1974; Long, 1967; Neiman, 1982; Ostrom, 1983). The SSGI thesis also states that a lack of local resources and inequalities can be faced via inter-governmental agreements towards collaboration, demanding an active role of "overlapping governmental units in redistributing resources" (Ostrom, 1983:93). This statement stresses the usefulness of local policies and institutional designs to regulate self-interest practices to face challenges arising from the distribution of public goods and services with the "process of

experimentation catalysed by public entrepreneurs operating at all scales" (Wright et al., 2011:17).

Scholars such as Wright et al. (2011) and Oakerson and Parks (2011) advocate the ideas of 'polycentricity' on the basis of greater autonomy of local governments and a strengthening of their capabilities to provide goods and services to effectively respond to different local needs. Kübler and Rochat (2019) argue that social inequalities are the result of a mismatch between resources and needs, arguing that the stronger the capability to generate/obtain municipal revenues, the greater the chances are of avoiding competition between jurisdictions as a cause of inequalities.

4.3.2 Inter-governmental agreements. A perspective from the SSGI thesis

As the SSGI thesis states, a relevant mechanism to address socio-spatial inequalities associated with the distribution of public goods and services in the Santiago metropolitan context can be through the inter-governmental agreements between the units of decision-making based on patterns of collaboration (Ostrom, 1991). In this regard, this attribute assumes that these decision-making units have the capacity to leverage strategies and resources by creating a coherent set of rules or patterns towards collaboration (Ostrom, 1999; Carlisle and Gruby, 2019). The relevant concepts are defined below in order to undertake an analysis of the agreements involved in the deployment of the inter-*comunal* BSS in Santiago, developed in-depth in Chapter 7.

4.3.2.1 Collaborative inter-governmental patterns

Collaboration comprises both a multi-level dynamic describing a process of decision-making "where multiple independent actors interact to produce an outcome that is commonly valued" (Oakerson and Parks, 2011:153) and where the value of collaboration lies in reinforcing different capabilities levels with unified objectives. Two dimensions of collaboration between the semi-autonomous units of decision-making are relevant under the rationale of polycentrism. On the one hand, from a spatial planning perspective, polycentricity in urban research recognises collaboration as a spatial function to achieve territorial cohesion (Meeteren et al., 2016). On the other hand, McGinnis (1999:4) argues

that “polycentricity allows considerable mixing and matching of consumption, provision, and production units operating at different scales of aggregation”.

Cefai (2007) refers to collaboration by including all the possible ways in which this could be possible, constituted by individuals who share a common objective, and facing tensions between cooperation and competition to other collectives. From the perspective of collaborative governance practices, Emerson et al. (2012:2) define collaboration as “the processes and structures of public policy decision-making and management that engage people constructively across the boundaries of public agencies, levels of government, and/or the public, private and civic spheres in order to carry out a public purpose that could not otherwise be accomplished”. Here, these authors stress governance and collaboration by recognising different units of decision-making to create new forms of ‘cross-boundary’ governance.

Furthermore, Carlisle and Gruby (2019) understand collaboration in a broader sense, emphasising a voluntary joint action that gives shape to a process that includes various formal and informal mechanisms to legitimise jointly made commitments. These authors also argue that this is a crucial matter of a governance system’s functionality due to the real need for decision-making units to engage with others to produce, provide, and distribute goods and services.

This thesis considers collaboration broadly as an essential attribute of the functionality of a governance system, based on a voluntary joint action to produce and deliver goods and services for public purposes, carrying out a process to constructively engage a constellation of actors. Key to the collaborative process of deploying the BSS in Santiago is the understanding of the way by which travel needs are recognised so as to be able to emphasise the sense of sharing as a common goal, defining the way in which the collaboration is conducted. Similarly, this assumes different contractual commitments to achieve a unified system in Santiago to leverage and maintain the required cohesion over time. It implies creating an enabling context of decision-making, such as cross-border governmental and non-governmental actions to work towards public purpose and common benefits. It also implies recognising and working through tensions between collaboration and competition, local/collective identity conflicts, and modification/introduction of new routines and activities. From an institutional point of view, the attribute of collaboration is considered here an assemblage of semi-

autonomous decision-making units under ‘taking one another into account’ rationality (Ostrom, 1991).

4.3.2.2 Self-organised practices and socio-spatial inequalities

Competition and segregation are related concepts in this research in so far as they influence socio-spatial inequalities (Ostrom, 1983). Inequalities are considered here from the perspective of Otero-Bahamon (2019:188), who stated that some groups of people are “a marker for stratification and segregation among culturally defined (or constructed) groups”, referring to sub-national inequalities that determine uneven accessibility to fulfil social needs and well-being. Moreover, the concept of stratification, considering the SSGI thesis, is linked with the notion of self-organised practices (Ostrom, 1983), which operate on the basis of a certain status, such as class, gender, race/ethnicity, with a territorial expression (Lobao et al., 2007) and evidencing a difference “between subnational units of the same country on dimensions related to the capabilities needed to access the things that people have reason to value” (Otero-Bahamon, 2019:189).

Collaboration and segregation are relevant conceptualisations in this research as they show a mismatch in terms of institutional capabilities, power and values over shared resources, leading to disputes that affect the distribution and utilisation of public goods and services (Dietz, Ostrom, & Stern, 2003). These authors also argued an equal importance to analyse tensions and disputes when designing and/or adjusting current institutions concurrently with the shared resources itself. Therefore, non-collaborative patterns refer here to self-organised institutional and organisational practices. Considering the arguments comprising the SSGI thesis regarding a municipal self-organisation pattern with spatial segregation effects, the municipalities would be facing competition for certain types of residents at the same time restricting access to others (Ostrom, 1983). It also explains that this phenomenon would be occurring in contiguous or near decision-making units with some access to information. Thus, segregated-related competition relates to a competition-policy issue (Craw, 2015). Here, a municipal economic constraint is assumed as a subject of biases, which makes a difference in local government capabilities to attract and/or leverage public investment and provide public goods and services.

Regarding the mechanism to self-organisation related to local governments, Down (1994) discussed the existence of a planning mechanism to limit housing opportunities for less

advantaged groups in some wealthy municipalities. Lowery (2000:65) also argued that rich municipalities hinder the arrival of other diverse and more disadvantaged groups “by the absence of a political forum in which it might be addressed”. Craw (2015) states that political institutions could mediate the local expenditure and taxes so there arises ‘inter-governmental competition’. Therefore, political dynamics could strongly influence local decision-making as a source of segregation associated with local self-organisation mechanisms (Ostrom, 1983; Kübler, & Rochat, 2019). However, and even though collaborative practices exist, da Silveira and Richards (2013) found that, in such highly ‘competitive’ contexts, collaborative actions can be negatively affected in terms of the effectiveness of their actions over time. Indeed, self-organised actions by the municipalities are also a matter of government capabilities to interact with others, where persistence in collaborative action is crucial, considering the fact that institutions enhancing collaboration may lose the initial meaning that brought them together (Imperial, 1999; Olsson et al., 2007; Carlisle, 2018; Stadtler, 2018; Carlisle and Gruby, 2019).

Regarding the context of this research, for BSS users as for other transport users, accessibility is a cross-boundary matter across a metropolitan area such as Santiago. When looking at the travel patterns there, few ‘wealthy’ areas concentrate the majority of the trips. In this regard, the role of inter-governmental agreements helps to answer the research question, an issue further examined through the matter of contracts and collaboration.

4.4 How contracts enable collaboration

A contract is not an easy task to execute by institutions and organisations. Its design depends on the broader institutional environment and the lens through which the state is seen. In contexts of deregulation, privatisation and competitive decision-making such as those in Chile, an important challenge relates to the new forms of control and governance, not only aiming to cease conflictive ‘rationale self-interest’ but rather to align self-interest with the public interest and public values (Docherty et al., 2018).

In such contexts, although governments still retain the power to define the characteristics of new services (usually through feasibility studies and business models in the initial

stages of a niche-deployment), in practice, non-governmental and profit-driven organisations are likely to lead their deployments (Hrelja et al., 2018). Under these 'institutional arenas', the provision of such new transport services introduces concerns over novel forms of governance and control over resources due to the mismatch of different goals and logics between the key partners. Discussions in this regard range from the notion of an authority mediating/consolidating the operational levels (Gudmundsson et al., 2015) as well as partnership approaches aiming to support the operational levels in terms of service quality and reliability (Davison and Knowles, 2006; Rye and Westrand, 2014; Hrelja et al., 2018).

It has been pointed out that contracts can be incomplete (Yvrande-Billon, 2006; Hart, 2017). Hrelja et al. (2018) refer to this as a matter of how actors are considered, assuming they will act in a self-interested way. North (2005:viii) argued for the need to change the perception of actors to tackle unexpected and undesirable issues. These visions also relate to the premise of working on common interests and collaboration. Hrelja et al. (2018) further discuss two strands in contracting to address 'self-interested' actions. On the one hand, one strand says contracts should be very precise about every detail of the provision and distribution of a given service, including the key performance indicators (KPIs) and indicators for measuring compliance in order to guide actions and avoid opportunism. On the other hand, these authors also recognise the difficulties establishing and adjusting such clarifications to reality as well as the importance of instances of ongoing learning processes over a signed contract for the fulfilment of agreed goals, especially in previously unreferenced or completely new scenarios. Furthermore, scholars such as Hensher and Stanley (2010) argue for a performance-based negotiation contract to avoid contractual hazards, calling for 'trusting partnerships' towards more 'relational contracting forms' between actors. This is particularly relevant in the relationship between public authorities and operators as a means to facilitate collaboration between different institutions and organisations involved. Key issues here relate to the alignment between high-level goals and processes of decision-making built up on collaboration, deliberation as well as democratic deliberation practices towards trust-building processes as the basis of 'trusting partnerships' (Hrelja et al., 2018). Therefore, this thesis is in line with the idea posed by these latter authors (Ibid:329) when arguing that 'contracts are less highly specific and more reliant on process'. They also argue that it is not a matter of disregarding specifications but rethinking how to deal with

unexpected scenarios, particularly when facing power relationships (Van Slyke, 2009) and difficulties in reaching agreed objectives. In this regard, transparency and trust are key factors based on the understanding of differences in roles, capabilities, conditions and beliefs (Schot and Geels, 2007), as well as in shared experiences and evidence (O'Neil, 2002).

Considering the contractual types in technological niche deployments, such as the BSS in Santiago, in conjunction with an absence of robust political, legal and regulatory frames, contracts could take different forms, depending basically on the level of state involvement in the process design, implementation and operation (Chapter 6,7 and 8). Thus, contracts can range from direct awarding at the local or regional levels to negotiated performance-based contracts, including those via corporate social responsibility based on outsourcing. They could also differ in terms of competitive tendering processes, depending on technical and administrative characteristics. This thesis seeks to understand contractual challenges in collaboration that institutions and organisations may face in the deployment of a niche-innovation in transport, particularly in a highly socio-economic segregation context with weak institutions such as Santiago, where mixed governance (Dávila and Brand, 2012) and flexible contracts take place. In this sense, the main concern here relates to collaborative challenges within 'institutional arenas', through the lens of collective action outlined and linked to the operational levels through motivational and asymmetry of information (Chapter 7), issues explained below.

4.4.1 Motivational and information problems at the operational level: an approach from relational contracting

Motivational and informational problems relate to collective action problems. Ostrom et al. (2014:3) argued that "a lack of motivation and/or missing or asymmetric information generates incentives that prevent individuals from satisfactorily resolving a collective-action situation". These problems concern to public goods, common-pool resources, and the 'Samaritan's dilemma' framework. They are present in at least in three levels of governance: the constitutional level, policymaking (also called collective choice) and the operational level (Gibson et al., 2005; Ostrom et al., 2014). In this research, the focus is on the links between the last two levels mentioned. Those institutional and organizational problems are described below.

It is worth mentioning first that these problems vary according to the nature of the good. For public goods and services available to all members of society, problems occur when there is a free ride issue, that is, for example, when a service is consumed without contributions from users. For common-pool resources or shared goods and services available to members of a community, the problem is about how they are shared. In other words, when one person's use subtracts from the resource available to others. Thus, without effective institutions, too many users with this attitude may lead to over-exploitation or loss of the resource (Ostrom et al., 1994). The Samaritan's dilemma occurs in development assistance but also involves infrastructure maintenance. Here, the dilemma is about helping and the efforts to deliver/receive aid. Thus, if the donor extends help but the recipient needs to exert high effort, this is argued as not the best strategy for the recipient despite the benefits perceived (Ostrom et al., 2014).

These authors also state that motivational and informational problems relate to incentives, or lack of incentives, that do not have satisfactory outcomes. In addition, asymmetry or lack of information occurs when an overview of the situation that actors face is not possible to obtain, as well as the linkages to outcomes and the perception of benefits may be partial (Holmstrom, 1982; Miller, 1992; Moe, 1984). Ostrom et al. (2014) also argued that these problems also relate to poor incentives regarding a mismatch between different views over common goals between actors, the inability to comply with contracts, and bad decisions due to a lack of information. Even though the institutional analysis framework contributes significantly to shedding light on the social and environmental problems faced in such an 'enabling environment', the conceptualisation of social inequalities in technological deployments is worked out here as a prelude to the analysis of incentives, commonly addressed by the Institutional Analysis framework.

Motivation and information issues provide a relevant insight that gives rise to linkages between the institutional and operational level, under the understanding that these are learning processes about a signed contract, from a more relational contracting perspective towards a mobility justice transition agenda, rather than an assessment to overcome contractual hazards. In this regard, conflict and tension analysis require explicit and well-framed analytical tools to adequately look at issues in collaboration, as in motivational and asymmetry of information and power. A corporate responsible sustainability framework associated with the paradox perspective is a suitable analytical framework to reveal contradictions, tensions but also the simultaneous synergies that

characterise competing social and environmental needs and profitability. A corporate-social-responsibility-related perspective based on outsourcing of an operation is outlined at the end of this chapter to introduce the case study.

4.4.2 From corporate sustainability to 'effective' philanthropy approaches

Literature on corporate sustainability conventionally refers to a proactive organisational strategy via a developmental approach to profit, people and the planet to ensure an organisation's long-term growth (Jayakumar, 2016), under the rationale that firms will perform better by incorporating sustainable practices in their business strategies (Bonn and Fisher, 2011; Nguyen and Slater, 2010). However, different strands emerged in the last decades. In this regard, Corporate Social Responsibility (CRS) has emerged in the 1990s as a result of the abandonment of more collective forms of social solidarity (Brammer et al., 2012), incorporating neo-liberal and market functions as a means to resolve collective actions problems. This has emphasised the role of firms in addressing social and environmental challenges and thus shifting from state responsibility as a political matter to the 'voluntary' will of private firms to fulfil social needs.

Different variants of corporate sustainability have been reported, ranging from incorporating sustainable activities as a "part of a company's routine operations, with its economic profit serving the long-term goal of contributing to social welfare" (Zollo, 2003:19) to spheres further away from the daily routines of organisations (see, for example, Jayakumar, 2016). A relevant strand to analyse is the philanthropic strand of corporate sustainability, considering the 'enabling environmental' context that takes place to deploy the BSS in focus and the subsequent outcomes (Carroll, 2012; Docherty et al., 2018). Indeed, a neo-liberal discourse in philanthropic organisations has taken over under the assumption of "solving the world's problems through market-like" actions (Eikenberry and Mirabella, 2018:43). These practices, also called 'effective' philanthropy', comprise the 'philanthro-capitalism' and 'effective altruism' perspectives (Goss, 2016; Reckhow 2016; Reich 2016; Eikenberry and Mirabella, 2018), referring to similar social, economic and sustainability concerns and using metrics to operationalise their decisions. However, they differ in terms of their assumptions about giving and, thereby, how they proceed in practice.

Philanthro-capitalism refers to business strategies leveraging “the profit motive for social good” (Bishop and Green, 2008:6), thus seeking better organisational performance. It is characterised by large-scale, metric-based interventions assuming no conflict between market-like approaches in promoting changes (Edwards, 2015) and making their intentions and efforts explicit (Eikenberry and Mirabella, 2018). In terms of decision-making, ‘philanthro-capitalists’ use estimations and criteria to decide which group to benefit after determining their specific causes to address, under the rationale that “all causes are equally valued” (Eikenberry and Mirabella, 2018:44). On the other hand, ‘effective altruists’ believe in evidence-based donation decision-making, where metrics play a crucial role in deciding which cause to support (Schambra, 2014). Thus, these practices can be described as “a radical utilitarian approach to giving” (Schambra, 2014:1), referring to metrics such as Quality Adjusted Life-Years (QALYs), often used to measure lives saved or lives improved, setting standards in ‘development economics’ (Clough, 2015) and determining “the most effective ways to improve the world” in so doing (Singer, 2015a:11). Under this neoliberal philanthropic decision-making rationale, needs have become utilitarian and exchangeable QALY widgets reliant on estimations, criteria and performance-focused donors over time (Malone et al., 2005).

Philanthropy can have a high impact on social policy, influencing both who they decide to benefit and how social spending is provided since a shift from “the governmental and political sphere over social concerns to private metrics in their own performance and accountability” can be perceived (Eikenberry and Mirabella, 2018:43). Such organisational practices are usually found entangled between matters of privatisation and deregulation, thus embedded in public-private partnerships and various flexible-mixed type agreements. However, as a matter of public policy, they operate on an individual basis of metrics, lacking a clearly defined framework of planning and management to ensure public values. Montero (2020) argues, through the concept of ‘leveraging cities’, the existence of a logic that mobilises certain urban policies as trans-national policy models, which are circulated by international development and philanthropic organisations as ‘best practices’, introducing interventions as ready-made solutions to fulfil their own metrics.

Here, the state seems increasingly oriented towards voluntary and non-governmental efforts to address social complexities and challenges (Dean, 2015; Henriksen et al., 2012). In this regard, Nickel and Eikenberry (2007) stated the existence of a ‘voluntary

state' rationale comprised by a philanthro-capitalist elite and firms as power groups, influencing the public sphere from a different sphere of action and without democratic deliberation. In turn, there is a hybrid context of decision-making deciding "the 'why' [the public policy and institutional setting], the 'what' (the rules of the game), 'who' (the networks of actors and their position, power and objectives) and 'how' [the way in which the public is involved in social interventions, 'how' benefits are perceived and accountability and transparency are maintained] (Docherty et al., 2018:117-118).

Under this 'voluntary state' rationale, one of the main critiques of this particular 'enabling environment' is those interventions with unequal influence on public and social policy, which lead to reproducing the same social and economic inequalities that they seek to challenge (Arnove, 1980; Roelofs, 1995; Siegel, 2012; Silver, 2012; Reich, 2016; Theodossopoulos, 2016). As a result, there is a mismatch between the needs and resources in philanthropic practices related to social needs, as philanthropy takes place as "market opportunities rather than as political questions" (Nickel and Eikenberry 2013:2). The main discussion and criticisms of these complex neo-liberal practices in philanthropy are discussed below, introducing one of the applications that have emerged this last decade in the field of transport in highly unequal metropolitan contexts in Latin-America. In this regard, Private Social Investment (PSI) is presented first and then addressed as a case study (Chapter 7).

4.4.3 Private Social Investment in bike-sharing

Private Social Investment (PSI) has been defined as one of the most relevant organisations supporting social causes in the last decade, through the Group of Institutions, Foundations and Enterprises (GIFE), 'movement' contextualised in Latin-America, and led by a Brazilian business association, which invests in social, cultural and environmental purposes in such a context (Nogueira and Schommer, 2009). Andion et al. (2012:409) refer to the PSI scheme as "a planned, monitored, and systematic voluntary allocation of private resources" – whether financial, monetary, human, technical or managerial – for the public interest. Thus, PSI is understood as a voluntary resource allocation aiming at transforming conventional philanthropy, to a more 'creative' donor action participation in projects of 'public interest' (Andion et al., 2012). As an example of a GIFE organisation, Itaú Unibanco Holding S.A, decided on four strategic lines or causes

to allocate private resources through PSI schemes: education, sustainability, health and urban mobility. Therefore, a Bicycle Sharing Scheme is part of the financial interest of an international investment holding company in the pursuit of sustainable and social goals. Thus, a 'philanthropic' practice supported by large investment companies is motivated by specific urban mobility objectives, consolidating a hybrid public-private organisational scenario to deploy an emerging mobility system. In this research, a BSS is an institutional target for a voluntary allocation of resources. Here, the mobility scheme deployment is formulated as a mobility 'cause' through a Private Social Investment scheme (PSI), aiming to provide 'access to a safe, affordable, and sustainable transport system' in different countries of Latin-America, such as Brazil, Chile and recently Argentina.

What is relevant to research like this in PSI, is the influence that this 'philanthropic' scheme would exert on the public sphere and the assumptions under which an 'enabling environment' is created for its inception, with the emphasis here on the public network and its instruments that nurture its deployment. That is, the relationship between the trans-national and sub-national levels as decision-making arenas in Santiago, and the *comunal* cluster as a unit of analysis. Considering a hybrid and a flexible scenario where a PSI scheme is introduced, agreements become a relevant subject of analysis, giving rise to complexities and tensions derived from those collaborative scenarios. In this regard, the corporate sustainability and the paradox perspective summarises the key principles that define the analytical framework proposed here to analyse the implementation of the BSS in Santiago.

4.4.4 Corporate sustainability and the paradox perspective

Corporate sustainability literature has also recognised the existence of inherent tensions and complexities in managing the societal and environmental goals (Aram, 1989; Kaptein and Wempe, 2001; Vilanova et al., 2009; Margolis and Walsh, 2003; Calton and Payne, 2003; Kallio, 2007; Haffar and Searcy, 2015; Van der Byl and Slawinski, 2015). However, the corporate sustainability and the paradox perspective has recently begun to be consolidated as an analytical framework to address these concerns (Gao and Bansal, 2013; Slawinski and Bansal, 2015; Hahn et al., 2014; 2015; 2018).

Paradox theory poses the existence of a “persistent contradiction between inter-dependent elements” (Schad et al., 2016:6) in reference to managing sustainability goals. Smith and Lewis (2011:381) refer to this as “how organisations can attend to competing demands simultaneously … [which require] … continuous efforts to meet multiple, divergent demands” for the long-term success of goals. In corporate sustainability perspective, inherent tensions and complexities lie in conflicting social, economic, and environmental dimensions (Hahn et al., 2015). Indeed, Hahn et al. (2018) clarify the conceptualisation of the paradox as “competing social and environmental needs and profitability” and not the “business case for sustainability” (Hahn et al, 2018:235). Luscher and Lewis (2008:234) state that “by accepting and ‘working through’ paradoxical situations”, it makes it possible to conduct processes of change. This is so not by “eliminating or resolving a paradox, but [by] constructing a more workable certainty” when recognising and dealing with complexities and unexpected tensions. Doing so allows addressing a more dynamic perspective in decision-making, especially in ‘enabling’ and unequal environments.

4.4.5 An analytical approach to the corporate sustainability paradox

Smith and Lewis (2011) defined four types of paradoxes: i) belonging, ii) learning, iii) organising, and iv) performing. Paradox in organization and performance is here addressed for the purpose of this research.

Paradoxes in organisation allow an understanding of tensions between collaborative and competitive practices when incorporating social and sustainability concerns into/under organisational and institutional structures (Smith and Lewis, 2011). Relevant to this research is the ongoing debate on how social and sustainability concerns are effectively incorporated and/or driven in a given organisational and institutional structure (Griffiths and Petrick, 2001; Yuan et al., 2011; Assens et al., 2015). A large body of literature is associated with the different types of incorporation of such practices into organisational and institutional structures, ranging from fully integrated practices within the business core to marginalised strategies, including independent bodies from the core structure. Paradoxes in organisation consider these different perspectives, thus contributing to a perspective of ‘working through’ the simultaneous and “competing social and environmental needs and profitability” (Hahn et al., 2018:235). While the integration into

organisational routines and activities could reinforce commercial benefits, it has also been said that separate spaces for social and sustainability activities can “flourish independently of prevailing business practices” (Yuan et al., 2011:77). Thus, to meet pursued societal and environmental challenges, this latter rationale would be looking for more flexible environments beyond the commercial and environmental areas with which organisations are affiliated (Hahn et al., 2018).

Paradoxes in performance relate to tensions pursuing organisational goals. Smith and Lewis (2011) explain that organisations may leave aside pursued concerns they originally had when facing multiple dilemmas derived from a market-led vision. In this regard, paradoxes in performance ‘work through’ ongoing improvisations, addressing simultaneously multiple areas of the organisational performance in a holistic and balanced approach, based on multiple economic, social and environmental outcomes. Research on organisational paradoxes offers an understanding of collaboration between governments and other institutions and organisations to help address institutional, organisational and societal challenges (Stadtler, 2018), giving rise to simultaneously competitive and collaborative issues as a dynamic of interaction, that is providing services, including humanitarian aid (a paradox also called coopetition, originally combining the notion of cooperation and competition) (e.g. Peloza and Falkenberg, 2009; Tomas and Fritz, 2006; Stadtler, 2018). Hahn and Pinkse (2014), stated that firms would tend to maximise their profits through competitive practices between the key partners, so they suggest assessing in the partnership design those undesirable elements that may detract from common objectives. However, it has also been argued that working simultaneously with competitive and collaborative scenarios, and actors can achieve something they cannot do unilaterally, going beyond a given metric or profit maximisation (Huxham, 1993; Stadtler, 2018).

Stadtler (2018) has recently found an insight to ‘walk through’ tensions in corporate sustainability, considering competitive and collaborative scenarios in multi-company Cross-Sector Social Partnerships (CSSP) when pursuing social goals. This author explored the structure of partnership management in terms of how collaboration and competition appeared simultaneously and how this paradox is addressed. Evidence suggested positive effects in collaboration derived from competitive practices within a CSSP structure, as well as relevant features in partnership designs to enhance collaboration over time. These features were related to the characteristics of the partners,

including prominent individuals and transparent commitments towards greater long-term contributions to avoid monopolistic and dependent structures. This author also found failures in sustaining commitment and engagement in philanthropic-oriented approaches based on reputational benefits and poor incentives in the implementation phase at the earliest stages of the implemented programmes under analysis.

Smith (2014) contributes with an understanding of the organisational paradox through a decision-making dynamic analysis of leader managers in key technological companies, expanding the notion of dilemmas to paradoxical issues when dilemmas persist over time. This author found dilemmas in resource allocation, fostering scenarios of flexibility and stability, where the more stability leaders experienced in allocating resources, the greater flexibility was found to allocate the resources, engaging tensions between both dilemmas and paradoxes. Moreover, in analysing dynamics in decision-making, integration and differentiation were required to 'work though' tensions by contrasting different business models regarding practices in technological innovations. From a practitioner's point of view, these findings suggest shifting time horizons for 'work through' tensions from a single solving-problem to a dynamic pattern of decision-making that better faces unexpected issues. Likewise, this author calls for more integrative ways for paradoxical thinking.

Stadtler and Wassenhove (2016) analysed conflicting organisational interests as a matter of trust to achieve common goals by narrowing down synergistic effects in collaborative and no-collaborative scenarios simultaneously at the same time with separate-based strategies, suggesting integration as an organisation's capability. Their research indicates that logics framed in a 'nested' identity, or an identity that brings them together, and a conceptualisation of different but interlinked logics helps to trigger collaboration avoiding extreme competition and, at the same time providing competitive advantages to the organisation. By using the conceptualisation of 'segmentation' referring to different logics of actions in different localities in conjunction with the notion of 'integration' in reference to synergies between these logics, their findings suggest that, in both a collaborative and non-collaborative humanitarian organisation research context, more flexible organisational structures are crucial to face tensions through the understanding of roles, conditions, and relationships between actors. Similarly, the mechanism of socialization and control are highlighted by addressing different social and normative logics. In this research, actors perceived social cause and collaborative commitments as

‘noble and different’ from conventional competitive market-led instances (Ibid:680), in addition to a perceived contribution that has positive outcomes. In the event of ‘misconducts’ instead of a control dynamic, increased social and moral pressure from key partners was found significant in addressing unilateral benefits, considering a humanitarian organisation context. Assens et al. (2019) found paradoxical strategies between territorial authorities, arguing that different local governments sharing responsibilities in regional projects face both simultaneously competitive and complementary issues due to overlapping competencies. This also highlights the political dimensions that may influence public investment and public management.

Thus, this analytical framework offers a position to place the focus on actors’ intervention encouraging diverse firms, organisations, governance and institutions to “embrace tensions to simultaneously accommodate competing yet interrelated economic, environmental and social concerns” (Hahn et al., 2018:237). In this regard, Stadtler (2018) analysed the collaborative partnership between business, companies and civil society to provide public goods and services which effectively enhance common interest towards delivering the expected social outcomes. Hrelja et al. (2018) further argued the need to build new forms of control and governance based on the trust-building process as the basis of ‘trusting partnerships’. Saud and Thomopoulos (2021) stressed the need for better alignment between the key partners towards pursuing societal objectives such as accessibility and equity. Thus, this research addresses paradoxes in organisation and performance, allowing the creation of linkages between the institutional and operational levels with social inequalities, focusing on the relevance of inter-governmental agreements to deploy the BSS in Santiago.

What is crucial in this regard is understanding who and how key partners are recognised and embedded in a particular partnership design, as well as the way by which common goals are planned and pursued. Through this perspective, the understanding of the planning and policy setting where the institutional vision of change is embedded as well as the institutional capabilities and practices, are all essential inputs to research mobility justice transition. In this regard, collaborative logics to deploy a BSS can account for transformative strategies leading to change scenarios. Thus, a retrospective institutional analysis complements an interventionist one.

In concrete and with an interventionist perspective, any tool developed to support a technological deployment requires specific actions to address public values. One of the key actions is to interrogate institutional capacities to address them, especially in hybrid governance scenarios. In other words, an explicit set of social justice values is required to pursue transformative goals. Also, the governance of the public values must be clearly articulated within the process to support the achievement of common objectives in the long-term. Otherwise, technological deployments could also be seen only as a 'ready-made' and 'universal' solutions (Temenos et al., 2017). Indeed, a niche configuration may fail to challenge the dominant regime logics that reproduce unsustainable and unequal production-consumption patterns by not addressing the real social and environmental challenges. However, this thesis also argues that prior institutional analysis is required to support subsequent interventionist work and address long-term challenges, thus, effectively transforming the regime's logic.

This subchapter has sought to provide an analytical approach towards understanding the construction of an 'enabling environment' to deploy a niche-innovation in transport and the condition under which it could lead to a mobility justice transition. Furthermore, it has attempted to create an approach to analysing the initial process of deployment of the BSS in Santiago under an institutional and organisational perspective. This analytical perspective considers both the synergetic and collaborative alignments that face socio-spatial inequalities simultaneously with motivational and information issues that may influence the reproduction of inequalities.

The second part of this chapter discusses an analytical model comprising the theoretical and analytical basis to approach the case study.

4.5 An analytical model (Phase II)

Consequently, with the theoretical framework developed in Chapter 3 in conjunction with the analytical framework developed in the first part of Chapter 4, the second part of this chapter presents an analytical model to guide the analysis in Chapters 6,7 and 8. Indeed, these chapters present the three-stages of analysis based on empirical information arising from the deployment process of the first inter-*comunal* BSS in Santiago. The analysis structure of the deployment process is as follows (for details see Chapter 2): a) Chapter 6: Analysis of early decisions, comprising the business model used to deploy the BSS in Santiago and the public tendering that took place, b) Chapter 7: The implementation process, considering the inter-governmental agreements, and c) Chapter 8: The operational level, comprising a survey carried out.

4.5.1 Chapter 6: Analysis of early decisions

This analytical stage aims to provide an understanding of the institutional rationale behind the BSS regional business model as a planning tool to deploy the first inter-*comunal* BSS in Santiago in order to analyse its role in triggering a mobility justice transition.

Chapter 6 analyses the regional business model (the regional business model or regional study), considering the definition of business models as "the rationale of how an organisation creates, delivers, and captures value'" (Osterwalder and Pigneur, 2010:14). Information regarding the regional business model is presented by the three major components: i) value proposition, ii) value creation, and iii) value capture.

In terms of the role of a business model in carrying out a transition process, Chapter 6 also includes the two-tendering types to deploy the BSS in Santiago. To answer the research question, this research considers the three functions of this planning tool in a process of change in conjunction with the Multi-Level Perspective to build the narrative in mobility justice transition while integrating the data in Chapter 8, Phase II, further discussed in sub-section 4.2.2 (Bidmon and Knab, 2018):

i) *As an industry recipe*
ii) *As a mechanism to commercialise technology*
iii) *Subject to innovation itself*

4.5.2 Chapter 7: The implementation process

Chapter 7 aims to provide linkages between the institutional and operational levels when implementing the BSS BikeSantiago, highlighting the role of the inter-governmental agreement in fostering or hindering the reproduction of socio-spatial inequalities. For both Chapters 6 and 7, the working statement is that alliances in support of niche-innovations operate within structures as rules, values and practices that influence society's actions systematically. Analysing this rationale, and working towards common interests based on collaborative patterns, is crucial for building a mobility justice transition pathway. Considering the corporate sustainability paradox as an analytical tool that brings together the required elements to answer the research question, Chapter 7 considers four qualitative categories to analyse a transition trajectory deploying a niche-innovation (Smith, 2014; Stadtler and Wassenhove, 2016; Standtler, 2018): ii) Scheme case, Private Social Investment (PSI), ii) the emerging patterns (collaboration and segregation), iii) aligned benefits, and iv) experienced tensions.

4.5.2.1 Scheme case, Private Social Investment (PSI)

Derived from the Corporate Sustainability framework, PSI is understood as a voluntary resource allocation aimed at transforming conventional philanthropy, to a more 'creative' donor action participation in projects of 'public interest' (Andion et al., 2012). The BSS BikeSantiago, therefore, is here considered as a 'philanthro-capitalist' practice, as this scheme relates to a 'cause' in mobility, which is led by Itaú Unibanco Holding S.A. in this case study.

4.5.2.2 Competition and self-organised practices

According to the SSGI thesis in socio-spatial inequalities, non-collaborative practices here relate to self-organised municipal practices in decision-making, considering the first type of public tendering based on isolated contracts in the three wealthiest *comunas* in Santiago. However, in contracting and public tendering terms, competition as self-organised actions by the municipalities is also a matter of governance capabilities to interact with others, in particular under market-led principles, where there is again a socio-spatial inequality discussion (Ostrom, 1983) which posed challenges in novel forms of governance and control over what is common and to whom.

4.5.2.3 Collaboration: the inter-governmental agreements

This thesis defines collaboration broadly as an essential attribute of the functionality of the governance system, based on a voluntary joint action between different institutions and organisations to produce and deliver goods and services for public purposes, carrying out a process to constructively engage a constellation of actors. In terms of contracts, the collaborative agreement to deploy the first inter-*comunal* BSS in Santiago, is considered here as a novel expression of the governance of this new transport service or as an 'enabling environment'. Key to this collaborative process is the way by which are understood needs, considering a mobility justice approach, as well as differences in roles, conditions and beliefs (Schot and Geels, 2007) to sustain commitment and cohesion over time. Therefore, Chapter 7 considers the notion of 'nested identity' referring to 'institutional alliance or cohesion for social integration, and 'segmentation' referring to different logics of actions in different areas of the city.

4.5.2.4 Aligned Benefits deploying the BSS BikeSantiago

Chapter 7 considers the intentions of a PSI practice in deploying the BSS BikeSantiago as a mobility 'cause', promising to deliver 'access to safe, affordable, and sustainable transport system', assuming a philanthro-capitalist action in an attempt to promote changes in mobility while implementing this system in 14 *comunas* in Santiago. From a donor point of view, benefits also relate to better organisational performance leveraging "the profit motive for social good'" (Bishop and Green, 2008:6), positioning Itaú Unibanco Holding S.A in the regional public sphere as a way to make their intentions and efforts explicit, including leadership and political alignment for this purpose.

4.5.2.5 Experienced tensions at the operational level

Considering that the BSS BikeSantiago was deployed partly via corporate sustainability purposes and financed by a PSI structure, tensions at the operational level consider a paradox in organisation (collaboration and competition or segregation), which relate to tensions created by the different tendering types that gave rise to the inter-*comunal* BSS in 14 *comunas*. It is relevant to consider that this perspective in paradox relates to the distributional perspective, as the focus is placed on the system performance. Three key aspects comprise the analysis of experienced tensions.

First, reputational issues related to the philanthropic action consider dilemmas as links between institutional and operational levels, in particular, due to institutional and organisational characteristics and the capabilities of making agreements in Santiago, as well as the nature of the inter-governmental agreement that took place in the tendering process. Second, dilemmas faced due to the two-tendering approach relate to the resulting organisational structure and its operational performance, revealing motivational and informational problems, which are framed in the Chilean context as a de-regulated 'enabling environment'. Third, paradoxical tensions in organisational dimensions consider tensions in terms of trust between the key actors as well as the way by which unexpected issues are dealt with in the first year of operation of the BSS BikeSantiago.

4.5.3 Chapter 8: the operational levels

Chapter 8 analyses the BSS BikeSantiago performance considering the first year of its full operation in the 14 *comunas* in order to understand the relationships between planning tools, agreements made, and the operational level in both fostering and hindering more equal and inclusive mobility landscapes. Here, the working statement is that the maintenance of the BSS BikeSantiago is significant in the levels of adoption and the perception of the benefits, which are shaped by the previous decision-making processes. Two key approaches comprise the following data analysis levels: one level focused on the users' profile, their travel patterns, as well as service levels and perceptions of benefits. Benefits were considered as described in the business model section in terms of improving health, saving time and money as well as perceived accessibility. Perceived accessibility refers to the ease of performing a frequent activity using the BSS compared to the previously used means of transport.

System performance or the key performance indicators (KPIs) are approached by the inter-governmental agreement made between the participating institutions and the service operator for the system's operation. Thus, an understanding of the critical factors at the operational level alongside social and institutional goals is provided in Chapter 8. How the BSS BikeSantiago is implemented and how it deals with delivering the service in 14 *comunas* is analysed here by observing the fleet distribution.

4.5.4 Integration of the data

As outlined in Chapter 2, this research adopted a “simultaneous integration or merging to develop integrated results and interpretations that expand the understanding to provide comprehensive results” (Cresswell and Plano Clark, 2017:221). Thus, the representation and interpretation of the integration here is done through a narrative (Cresswell and Plano Clark, 2011; 2017) by using the Multi-Level Perspective (Eaton, 2004; Geels and Schot, 2010; Roberts and Geels, 2019) and combining different analytical frameworks derived from Chapter 4. This gives rise to links that can describe the transition pathway.

Relevant to notice is the subject of analysis for a discussion of findings through the MLP narrative. Thus, decision-making practices comprised in the different stages of the deployment provide relevant linkages for a narrative in MLP, connecting key ideas to the mobility justice framework, as explained in Chapter 3. The integration is done in Chapter 8 – Phase II, summarising key findings first, followed by related conceptualisations across the results at the end of Chapter 8, on the understanding that different decision-making as institutional and organisational ‘practices’, i.e. the regional business model, the tendering process as well as the operational practices, are the subject of analysis. It allows giving rise to explanative factors to expand the understanding of a mobility justice transition and answer the research question through the lens of the MLP.

Chapter 5. Contextualising a sub-national research in mobility justice transition. The case of Santiago metropolitan region

Understanding mobility justice transitions involves grappling with the configuration and distribution of power while establishing links with governance capacity and political authority (Eaton, 2004) to address socio-spatial inequalities (Chapter 4).

Debates on metropolitan organization raised in Chapter 4 posed relevant strands to discuss socio-spatial inequalities, in a context where global inequalities have increased over the past decades (Milanovic, 2016).

This chapter offers a context for the unit of observation of Santiago Metropolitan Region, Chile's capital region, with over 7 million inhabitants distributed across 52 *comunas* (34 *comunas* comprise Greater Santiago). It is the most densely populated city in Chile and one of the metropolitan areas with the highest concentration of population and political power in Latin America (Valenzuela and Ortiz, 2017; Brinkhoff, 2020; National Institute of Statistics Chile, 2020). This chapter seeks to contextualize mobility justice transition research. Decentralization policies are a crucial institutional matter to discuss in this regard, particularly in the Chilean context as one of the most centralized countries in Latin America (Eaton, 2004). The institutional specificity regarding the design of the sub-national institutions in the context of decentralization policies is introduced first, describing how sub-national political authorities are constituted, what institutions can actually do, and the resources available to them. The relevance of this discussion lies in the top-down public policies approach promoting cycling through the BSS implementation. Socio-spatial inequalities in Santiago consider an introduction from the Social Priority Index, a regional tool to prioritise investment, an overview of travel patterns and accessibility in Santiago, and distribution of cycling facilities and characteristics of the cyclist. Key elements derived from regional transport planning in cycling and the cycling infrastructure distribution are described at the time of the BSS deployment.

5.1 The decentralization process in a centralist Chile

Decentralization is considered in this research as a process of transferring competencies and resources from the national to the sub-national levels of administration (Eaton, 2004), in this case, the regional and local levels, considering a constitutionally unitary country. The three most commonly used concepts in this respect are: political authority decentralization, administrative decentralization and fiscal decentralization. While decentralization of political authority relates to the decision of shifting from indirect to direct election of the subnational officials, decentralization of governance capacity refers to the specific rights and responsibilities in charge of the sub-national officials. In this regard, the national level delegates responsibility for planning, operational management and, to some extent, financing infrastructure and services. This is what this thesis highlights when referring to some degree of autonomy. Fiscal decentralization refers to taxation power over resources, namely public revenue and expenditure. Indeed, a decentralized sub-national unit can only perform its tasks effectively if it has the required resources and the decision-making power, which is a focus of this research by analysing the inter-governmental agreements reached to deploy the BSS in Santiago (Chapter 6 and 7) (Aylwin and Azocar, 1996; Moreno, 2013).

These three types of decentralization pose significant challenges in the nature of resources and sub-national capabilities over the taxation power and administration, considering the enormous differences that municipalities in Chile have in practice in accessing and managing fiscal resources. Therefore, it is significant to discuss the real available options to address the distributional dimensions of services and goods.

5.1.1 The process of decentralization in Chile

The process of decentralization began in Chile in 1974, during the context of the military regime. By means of decree-law number 573 the sub-national levels were created with administrative purposes for the administration of the regions, provinces and the *comunal* level. During this period, the country was initially divided into 12 regions and a metropolitan region. Then, this intermediate unit comprised provinces within the regions. For the local administration, the provinces were then subdivided into *comunas,* the basic administrative unit of the territory.

This decree also established that the regional government is in charge of a regional executive (*Intendentes*) and, in the provinces, by a governor. The president initially appointed both. Currently, *comunas* are administered by the municipalities under the charge of a mayor elected. However, a new re-distribution of power authority and policy-making capacity at the sub-national level took place in the 1990s, when important reforms made Chile a more decentralized country, particularly regarding the decentralization of political authority. Indeed, while in 1974, *comunal* mayors were also appointed by the president and the regional executive, in the 1990s, municipal democratization was introduced, shifting from indirect to direct election. Nevertheless, it was not the case of governors and regional executives until the data collection for this thesis. In this regard, the process of decentralization in governance capacity from the 1990's consisted of two key sub-national functions. On the one hand, *comunas* are in charge of local fiscal resources, including both those raised in their own jurisdictions as well as those leveraged from the national level. Likewise, municipalities as a basic unit of public goods administration include among their competencies the charging for services they provide and the concessions they grant as a means of generating revenue at the local level, and in turn, establishing a relationship of control over the provision of goods and services. To comply with their functions, the municipalities have, among other essential attributions, "the administration of municipal and national goods for public use, the establishment of rights for the services they provide, and for the permits and concessions they grant" (Law 18.695. Title I, Paragraph 1, Art 5). In doing so, the municipal or national goods of public use, that are "administered by the municipality, may be subject to concessions and permits" (Ibid. Paragraph 5. Article 36). In fact, one of the main ways to generate municipal revenues is through the permits and concessions they grant (Ibid. Article 13).

At the level of regions, on the other hand, regional executives (*Intendentes*) are directly appointed by the president at the time of this research. These officials play a double role as head of the regional government and as the representatives of the national level in the regions. In terms of regional fiscal resources, the regional government has no independent taxing authority. This fact is possible to corroborate when looking at the national budget law and the distribution of the national regional development fund, managed by the regional government in Chile.

According to the Law 19175 regarding regional governance in Chile, the regional government manages the territory comprised in their jurisdiction. Still, in practice, this

public institution seeks to improve the efficiency of public budgeting and investment, from the national level to the local level. This is so by evidencing the composition of the regional spending process and the decision-making in regional planning. In this regard, while the 'normative' *comunal* planning and land use regulations belong to the municipalities, the regional planning has an 'indicative' character, more in line to assist municipalities and provide public investment. Hence, even if moving from a hierarchical relationship of governance to one of management and negotiation between different institutions (Dávila and Brand, 2012), the regional level still remains a governance challenge regarding its competencies and participation in local decision-making (Eaton, 2004). Thus, the local level in Chile has a semi-local autonomy of decision-making, referring to spending and revenue decision-making capacity to provide, distribute and administer local goods and services. However, what happens in practice translates into a high dependence on national fiscal resources for an effective provision of basic services, such as health and education. Due to the centralised nature of Chile, the regional government today consists of coordinating and transferring national resources between the various territorial levels of administration. Therefore, the key issue for regional governments today is not related to a lack of resources but rather a lack of capacity to effectively execute those resources and be able to address inequalities at this level of governance.

This thesis considers a metropolitan governance regime as a unit of coordination based on multiple semi-autonomous local decision-making levels (Ostrom, Tiebout, & Warren, 1961; Ostrom, 2005), as discussed in Chapter 4. In this respect, *comunas* as a semi-autonomous unit of decision-making evidence a high level of disparities in the capacity to generate and leverage resources across Santiago city. Chile and Santiago as the capital shows, from the 1990s, a progressive devolution of governing capacity and political authority to the sub-national levels. However, the regional level remains a governance and institutional challenge to go beyond an 'enabling environment', more related to management and negotiation forms of governance (Dávila and Brand, 2012), a critical institutional juncture to address issues of socio-spatial inequalities. This is aggravated by a persistent centralist tendency, where urban regulation in Chile has a 'vertical' direction (Galentovic, 2006). That is, rules are imposed by top-down bodies, despite the fact that potential autonomy that local government has in terms of a

governance capacity and political authority, which led to scenarios of self-organization for purposes that favour only a few population groups located in wealthy *comunas.*

5.1.2 The Social Priority Index (SPI)

The Social Priority Index is defined as "a combined indicator that integrates relevant aspects of communal social development" (Ministry of Social Development and Family, 2017:4), i.e. the dimensions of: income, education and health of households in Santiago. It is a synthetic index whose numerical value makes it possible to measure the relative standard of living attained by the population of a *comuna.* Thus, the SPI value obtained by each *comuna* is only understood in relation to "the values of this index in the other *comunas*" (Ibid). Therefore, in illustrating socio-spatial inequalities in Chile, the Social Priority Index (SPI) (Table 5.1 and Figure 5.1) is a valuable regional mechanism to locate programmes, projects and/or resources in *comunas* with the greatest relative deprivation, expressed as a high, medium and low range of regional investment priority. As shown in Figure 5.1, there are clear differences between *comunas* regarding the investment priority. When looking at their spatialisation, there is a white cluster of non-prioritized *comunas in* the eastern part of the city, namely the wealthiest eastern-area of Santiago as non-prioritized areas. It is clear too that this white cluster is also an area of attraction for travel journeys, as well as the area of highest income concentration, as shown in Figure 5.1 (PNUD, 2017).

According to the population projection of 2017 (Ministry of Social Development and Family, 2017), both nationally and regionally, the most populated *comuna* in Chile is led in first place by Puente Alto *comuna* with 568,106 inhabitants, followed by Maipú with 521,627, Santiago in third place with 404,495 and then La Florida with 366,916.

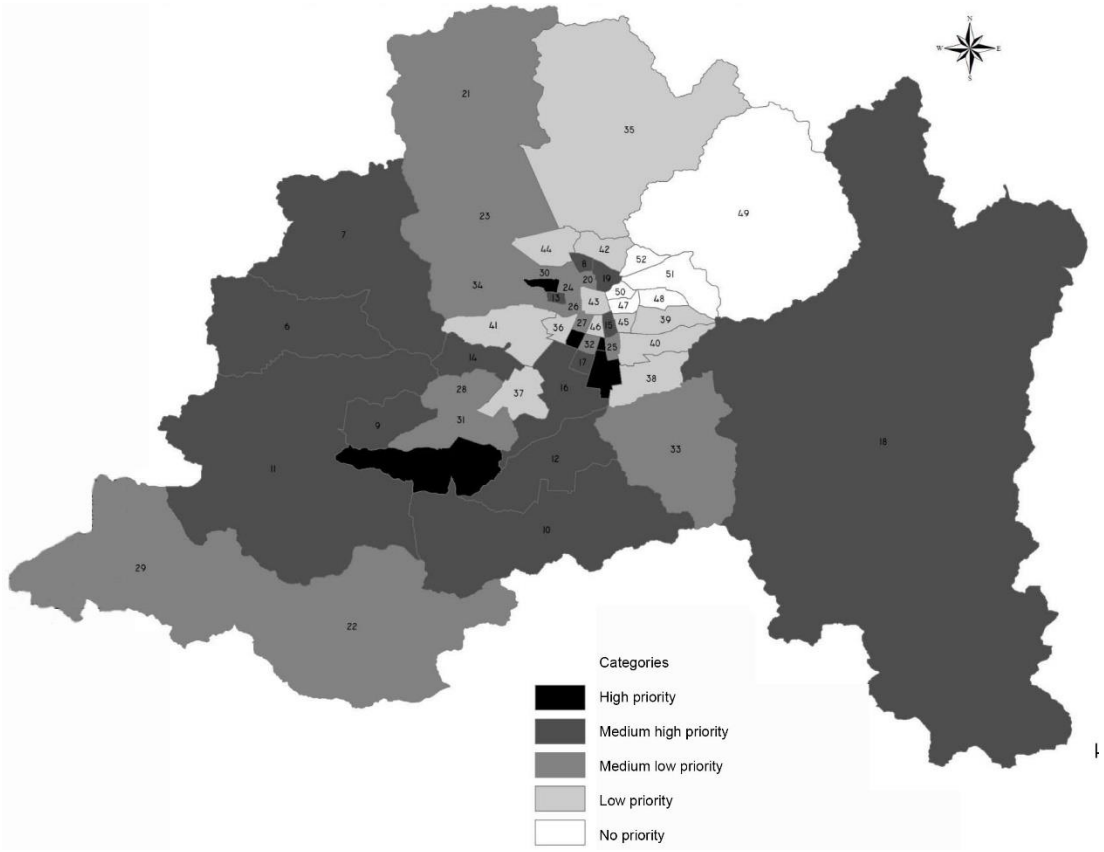

Figure 5.1: Metropolitan Region of Santiago *comunas* and SPI position by categories of public investment prioritization. In the white east area, the wealthiest *comunas* with no priority for regional investment. Source: Own elaboration based on Ministry of Social Development data (2017). Source: Ministry of Social Development and Family, 2017 1. Scale is referential in the source. Santiago metropolitan area comprises 52 *comunas* (rural and urban), in contrast to Greater Santiago area, with 34 urban *comunas* comprised in Santiago province or the centre of the region, in addition to Puente Alto (Cordillera province) and San Bernardo (Maipo province) as peri-urban *comunas.* Considering a trip from downtown to the southern *comunas,* e.g. Puente Alto (38), to Santiago (43) *comuna* (the busiest area), the travel distance is about 25 km and the travel time takes around 1:30 in the rush hour by public transport.

1 34 *comunas* belonging to Greater Santiago.

Table 5.1. List of *comunas* in Santiago Metropolitan region and their SPI position. Source: Ministry of Social Development and Family (2017). Ranking position number is the numbering of the *comunal* regional investment prioritisation.

Level	*Comuna*	Ranking
High Priority	La Pintana	1
	Lo Espejo	2
	Cerro Navia	3
	San Ramon	4
	Isla de Maipo	5
	Maria Pinto	6
Medium High Priority	Curacavi	7
	Conchali	8
	El Monte	9
	Paine	10
	Melipilla	11
	Buin	12
	Lo Prado	13
	Padre Hurtado	14
	San Joaquin	15
	San Bernardo	16
	El Bosque	17
	San Jose de Maipo	18
	Recoleta	19

Level	*Comuna*	Ranking
Medium Low Priority	Independencia	20
	Til Til	21
	Alhue	22
	Lampa	23
	Quinta Normal	24
	La Granja	25
	Estacion Central	26
	Pedro Aguirre Cerda	27
	Peñaflor	28
	San Pedro	29
	Renca	30
	Talagante	31
	La Cisterna	32
	Pirque	33
	Pudahuel	34
	Colina	35
	Cerrillos	36
	Calera de Tango	37
	Puente Alto	38

Level	*Comuna*	Ranking
Low Priority	Peñalolen	39
	La Florida	40
	Maipu	41
	Huechuraba	42
	Santiago	43
	Quilicura	44
	Macul	45
	San Miguel	46

Level	*Comuna*	Ranking
No Priority	Ñuñoa	47
	La Reina	48
	Lo Barnechea	49
	Providencia	50
	Las Condes	51
	Vitacura	52

5.2 An overview of travel patterns, distribution of cycling facilities and characteristics of cyclists

Socio-spatial inequalities in this research are examined though official information of current travel patterns derived from the Origin-Destination survey (2001 and 2012), accessibility in Santiago and cycling facilities distribution, including national and regional planning policies as outlined below.

5.2.1 Santiago Travel Origin - Destination Survey 2012

The travel origin-destination survey in Santiago (SECTRA, 2012) is summarised to explain current travel patterns across Santiago. This secondary source is the latest version from the official travel information in Santiago, aiming to support the infrastructure, planning process and project formulation to improve the mobility conditions of people and goods in Santiago, including transport policies in related areas. Therefore, these data describe the most common trips in the Santiago Metropolitan Area. Here, the focus is placed on the characteristics of the trips[2].

5.2.1.1 Total trips made

One of the main results of the 2012 survey relates to the total trips generated in Santiago. In a normal working day, it exceeded a total of 18 million trips, with an average of 2.78 trips per person per day and nine trips per day per household.

5.2.1.2 Modal split

Walking (34.5%), car (25.7%) and public transport (Metro and bus, 25%) were the three most used daily means of transport in Santiago. Trips made by non-motorized means of transport (walking and cycling) represented 38.5% of total trips for a normal working day,

2 According to this official source, a trip is defined as any journey made on public roads for a specific purpose, between two places (origin and destination) at a certain time of day, which may be made by various means of transport and consists of one or more stages; and by normal season, the period between the months of March and November, when educational activity is in full operation. The representative sample size was 18,000 households comprising the 45 busiest *comunas* in Santiago metropolitan area. The Metropolitan area of Santiago comprises 52 *comunas* within their jurisdiction. The measured area comprised around 6.5 million people, with an estimated 1,160,000 private vehicles, 6,300 urban buses, 27,000 basic taxis, 11,000 urban collective taxis and five metro lines with 104 km of tracks.

with walking (trips made entirely on foot) being the most used means of transport (34.5%). Daily trips by bicycle counted for 747,000 every day in Santiago, representing 4% of the total trips made on a normal working day. Compared to 2001, cycling trips increased (SECTRA, 2001).

5.2.1.3 Main characteristics of trips in Santiago

The trip characteristics and the concentration of the population by sectors in the city showed that walking is the most used mode, except in the wealthiest *comunas* concentrated in the east sector of the city and some of the south-east, which are far from the urban centres. Equally, while the wealthiest *comunas* located in the east sector were the areas with the highest generation of private transport trips, poorer *comunas* in the south-east sectors showed a greater use of public transport. Likewise, the east sector (wealthiest *comunas*) had the highest use of automobiles and bicycles, while the highest use of public transport occurs in *comunas* located in the west and south-east sectors of Santiago. Comparing the travel origin-destination survey in Santiago between 2001 and 2012, it is worth mentioning that the population in Santiago grew 27% in the number of households and 13% in inhabitants. However, it was significant that the vehicle fleet increased by 60% in this period, as shown in Tables 5.2 and 5.3.

Table 5.2. Population, household and vehicle growth between 2001 and 2012. Source: Origin-Destination Survey (SECTRA, 2012)

Year	Households	Inhabitants	Vehicles
2001	1,522,607	5,538,635	596,325
2012	1,938,463	6,268,039	1,115,295

Table 5.3. Evolution of household size and motorization rate in Santiago between 2001 and 2012. Source: Origin-Destination Survey 2012

Year	Inhabitants/Households	Vehicles / Inhabitants	Vehicles / 1000 inhabitants
2001	3,64	0,46	125,7
2012	3,23	0,58	177,9

5.2.2 Accessibility in Santiago

Over the last decade, Santiago has experienced a strong process of urban expansion resulting in accelerated gross domestic growth initiated by the return to democracy (Ffrench-Davis, 2018). The urban effects of such macroeconomic policies can be seen from the processes of urban expansion (Galentovic, 2006) and population and household and vehicle growth between 2001 and 2012 (Contreras et al., 2016).

Despite Chile's strong growth, it is indeed an emerging middle-income economy (about 40% of that of the United States) (Foxley et al., 2017; Ffrench-Davis, 2018) with the highest level of socio-economic inequality within the OECD. Chile has one of the highest ratios in terms of income of the wealthiest group, 10%, and that of the poorest 10%, when contrasted to all OECD countries (OECD, 2018). Chile also shows significant inequality in the key elements of development, with persisting gaps in quality of employment, gender, quality of public services and availability of goods and services, spatially manifested in strong residential segregation and concentration of activities (Figueroa et al., 2108). This is evident when looking at the high level of spatial concentration of high-income households in the eastern sector (also called the high-income cone, see Figure 5.2), as well as the segregation of the poorest households scattered throughout the city, especially in the southern sector. This pattern of segregation is observed along with homogeneity of its urban spaces and households of similar social conditions (Sabatini et al., 2010) regarding the poorest households. This pattern also presents a duality with respect to the will to self-segregation as well as one that was forced as a product of Pinochet's dictatorial regime and the subsequent social housing policies based on market-led principles. For the former group, self-segregation is accompanied by investment in infrastructure to access these locations. For the latter group, the insufficient provision of public goods and basic services locally (Rodriguez and Sugranyes, 2005) is clear evidence of the socio-economic inequality that affects Chile due to its development model and the deregulated urban land market (PNUD, 2017) despite the public policies to reduce poverty and improvements in irregular settlements (Techo-Chile, 2016). The insufficient provision of public goods and basic services in some deprived areas of Santiago (areas in light blue in Figure 5.2) also demonstrates that urban activities are highly concentrated in only certain areas, forcing the majority of the population to move to these locations (Figure 5.3).

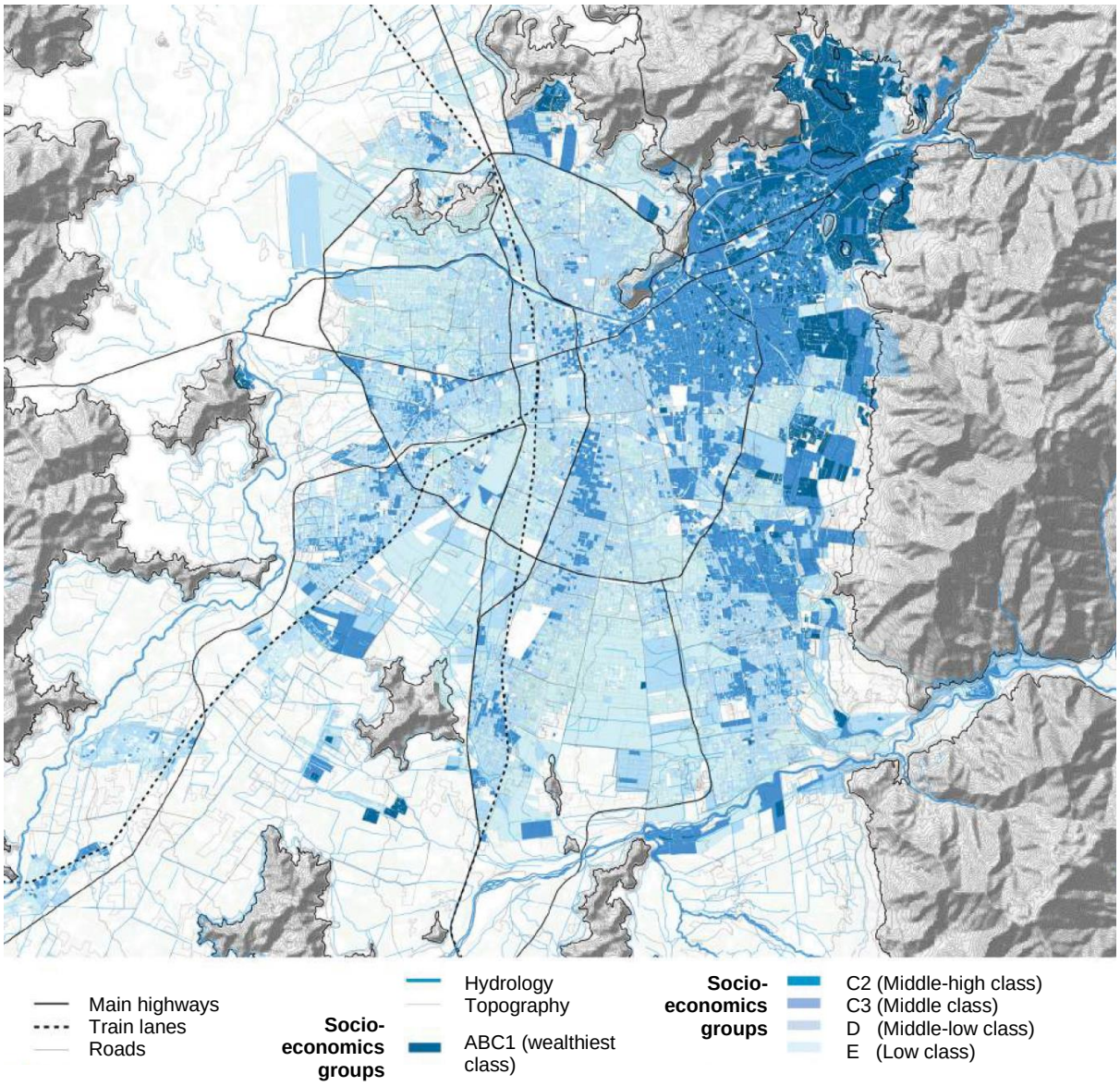

Figure 5.2 Socio-economic sectors and location in the Metropolitan Area of Santiago by 2012. The map shows the location of the various sectors of the socio-economic groups distributed in the region. The ABC1 sector is concentrated in the north-eastern sector of Santiago. Source: Santiago Metropolitan Regional Government, 2015. It is important to note that this source used secondary data such as the official information from Ministry of Housing and Urbanism, 2012, among others to create this map.

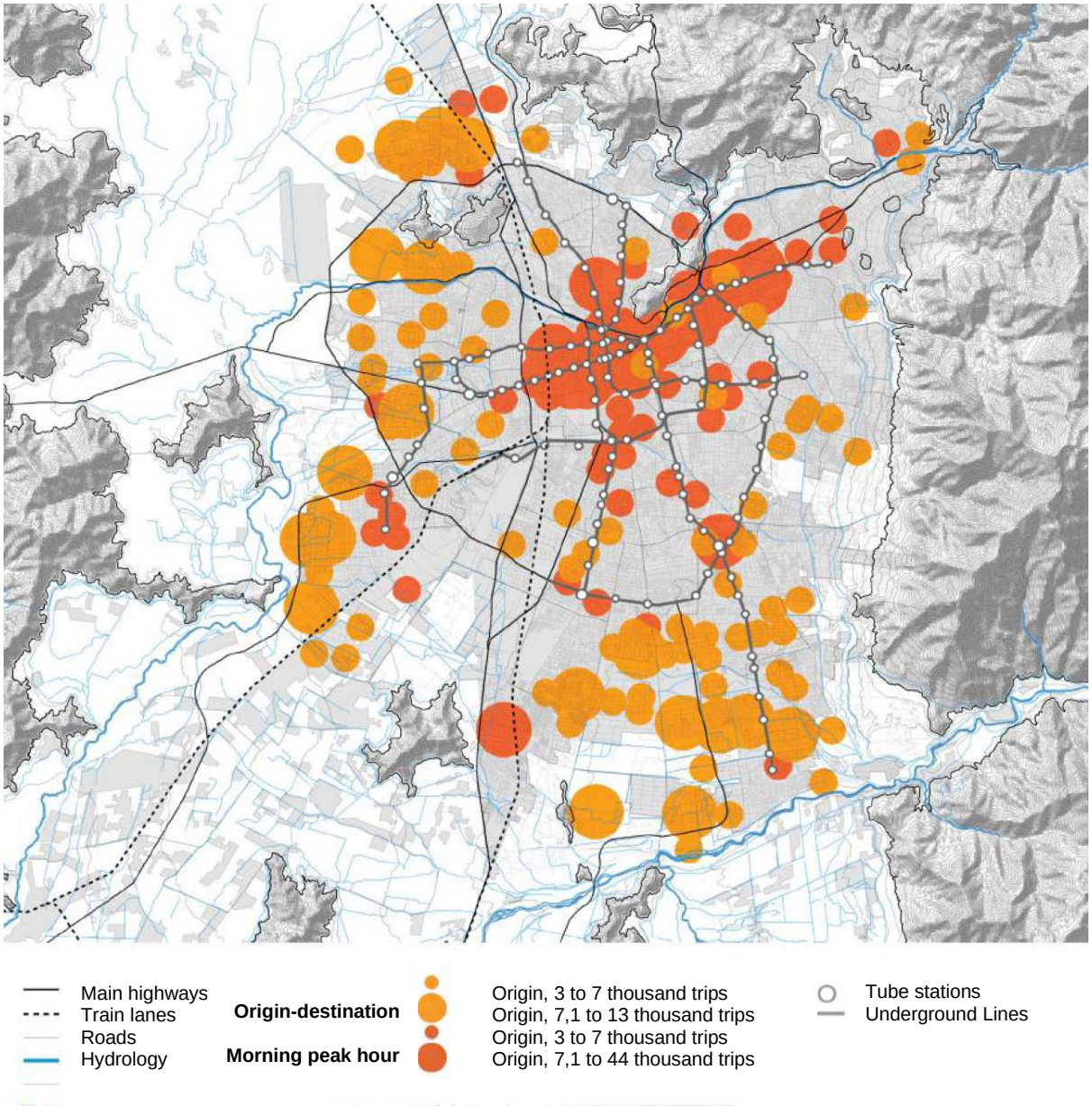

Figure 5.3 Road and transport system in the Metropolitan Area of Santiago and origin-destination survey, 2012. The map cross-references information on transport infrastructure in conjunction with the points of origin and destination of more than 3,000 trips per day in the morning peak hour. Here, a concentration of trips towards the central and north-eastern sector (the wealthiest areas) at the morning peak hour can be seen, evidencing a high dependence of peri-urban areas on these points of convergence of activities. Source: Santiago Metropolitan Regional Government, 2015.

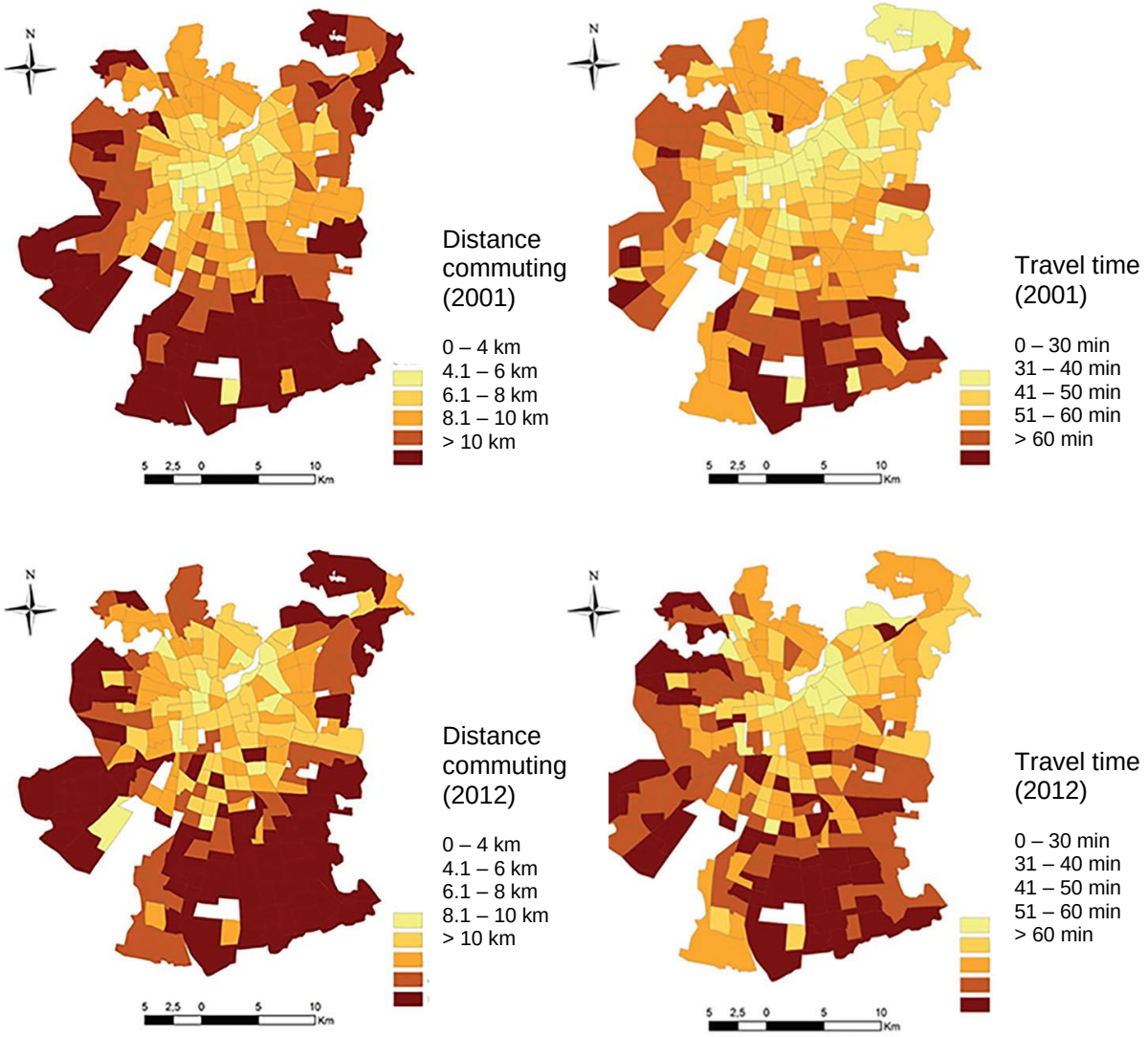

Figure 5.4 Distance commuting (maps on the left-hand side) and travel time (maps on the right-hand side) per area comprised in the origin-destination surveys 2001 and 2012 (comprising 730 areas). Source: Adapted from Contreras et al. (2016).

Contreras et al. (2016) developed maps showing accessibility in Santiago, characterising the distribution of the trips in Santiago, as Figure 5.4 shows. Through the use of the origin-destination surveys comparing the period 2001 and 2012, these authors calculated that

the average travel distance for Santiago is 8.2 kilometres, which proved to be constant for the two periods compared in general terms, despite the emergence of some urban centres in peri-urban *comunas* (Figure 5.4). They also observed that inhabitants of households located in central and peri-central *comunas* travel shorter distances on average. Travel time had worsened by 2012. These authors found that the travel time of the inhabitants of the southern and western peri-urban *comunas* of Santiago had deteriorated by 2012. Furthermore, travel times are not homogeneous between means of transport in Santiago. The results show that long distances are related to long travel times, which differ between different areas in relation to faster means of travel, such as cars in the wealthiest north-east area of Santiago as well as better connectivity and facilities, as Figure 5.4 shows.

Having briefly shown the characteristics of travel in Santiago, it is worth noting that a felt need in the provision and distribution of basic goods and services in Santiago is related to transport systems. Ureta (2017:24) explained that the public transport reform that took place in 2007 was "the worst public policy that has ever been implemented in our country", echoing the ideas that the ministers of that time highlighted. This is reflected in the results of the origin-destination survey for 2012, which shows an increase in the number of vehicles, on the one hand, and a deterioration in the quality of life of the people, on the other. Furthermore, this author explained in detail that this dehumanized and ambitious public transport modernization project failed as a result of an old-fashioned and segregated attempt of public policies based on complex infrastructures separated from the social order, connecting better residents in *comunas* with more facilities and investment capacities in detriment to those in more distant and disadvantaged *comunas* (Figueroa et al., 2018). Ureta (2017:24) concludes with a question: "where to situate the human being in an infrastructural policy such as Transantiago?" (the public transport system which includes buses and metro) (Latour, 1993). He answered that the place of humans in these public policies must be seen as one of the most transcendental and urgent political questions of our time. The failure of the public transport system in Santiago meant a worsening of people's quality of life, an increase in travel time and cost, and the deprivation of choice for many in favour of a few as a matter of private business.

This way of planning Santiago city has led to a city with high car dependency, long distances and travel times faced by the majority of the population, aggravated by the high levels of air pollution. Karekla et al. (2018) recognised that the biggest challenge in this

regard is changing social habits in Santiago, requiring promoting non-motorised means of transport, improvements to the transport system as well as road monitoring to reduce the current traffic flow. This discussion is addressed in this thesis through an institutional and organisational perspective, in particular with regard to the necessary alignment between technological developments in transport and transport needs to deploy accessible and fair systems.

5.2.3 Cycling and the built environment in Greater Santiago: a retrospective look at the urban landscape construction

In the context of promoting the use of bicycles in Santiago, it is relevant to analyse Santiago's cycling and the way in which the built environment has accompanied these policies. Indeed, one of the most relevant factors in promoting cycling relates to the physical infrastructure available (Saud, 2014; Rosetti et al., 2018). This retrospective look at the implementation of cycling infrastructure is based on the main conclusions contained in planning and regulatory background associated with cycling and the studies 'Relevance of public space in cycling route decisions', adapted from Saud (2014) to contextualise the distribution of the cycling infrastructure in the BSS pre-deployment process, secondary data derived from SECTRA (2013), and Santiago Metropolitan Regional Government (2012) for the characterization of a cyclist at the time of the BSS deployment.

5.2.3.1 Planning and regulatory background associated with cycling

In this subsection, the main planning and regulatory background associated with cycling in Chile is presented, comprising the following indicative and regulatory instruments both at the national and regional levels: Santiago Transport Master Plan 2025 (SECTRA, 2013c), the National Urban Development Policy (Ministry of Housing and Urbanism, 2013), the Regional Development Strategy for the Metropolitan Region 2012-2021 (Santiago Metropolitan Regional Government, 2013) and the Chilean Traffic Law N 18.290.

According to the ‘Santiago Transport Master Plan 2025’, the quality of life in the city of Santiago has deteriorated significantly in recent years, particularly in terms of mobility. This instrument warns, in a motorization growth trend scenario, that the number of vehicles will at least double between 2012 and 2025 from 1.3 to 2.7 million (SECTRA, 2013c). Therefore, this diagnosis urged the need to promote non-motorized means of transport, specifically targeting at increasing active travel by deploying an inter-*comunal* BSS. At the national public policy level, the National Urban Development Policy (Ministry of Housing and Urbanism, 2013) recognized the need to promote non-motorized means of transport. This was based on encouraging pedestrian traffic and bicycle use, ensuring universal accessibility with specific urban planning standards for public space, establishing the components, characteristics and minimum standards of quality and coverage for urban public goods, and promoting public transport systems with an intermodal offer and integrated fares that facilitate people's autonomy. At the regional level, the Regional Development Strategy for the Metropolitan Region 2012-2021 (Santiago Metropolitan Regional Government, 2013), referred to increasing the provision of bike-lanes and supporting a BSS deployment, from a management and coordination point of view, according to the institutional characteristics mentioned at the beginning of this chapter.

In terms of regulations, the Chilean Traffic Law N 18,290, the bicycle has the status of a vehicle, whereby a cyclist is considered as a driver, and its traffic space, like a car, is on the roadway and positioned preferably on the right side, except when there is a bike-lane.

5.2.3.2 Distribution of the cycling infrastructure at the BSS pre-deployment process

The distribution of the cycling infrastructure in Santiago is described below to contextualise the built environment when the BSS in focus was deployed, summarising the research conducted by Saud (2014) at the time. The main indicators that the author used were the quantification in linear metres (LM)[3] of bicycle lanes per *comunas* in Greater Santiago, the information provided by the Secretary of Transport (SECTRA) and population projections by *comuna* (Ministry of Social Development, 2012). This

3 The information presented on the average length of bicycle lanes is expressed in linear metres (LM) as many *comunas* do not reach the full kilometres built.

information is complemented by the Master Plan for bike lanes 2012-2020 developed by the Metropolitan Regional Government of Santiago and the SPI indicator (Table 5.1).

The average length in the 34 *comunas* of Greater Santiago was 6.3 kilometres per *comuna,* considering 215 km built in Greater Santiago by 2012. Santiago *comuna,* with a low SPI (position 43, or a low priority of regional investment, see Table 5.1 for details) and located downtown, has the largest number of ML, with 25,500 ML, in contrast to *comunas* such as Macul (SPI 45) or San Miguel (SPI 46) *comunas,* located at the pericentre of the city; however, with no presence of such infrastructure, as Figure 5.5 shows. The case of Puente Alto *comuna* is noteworthy with regard to the length of bike lanes. This *comuna* is located 20 kms from downtown, with a medium-low priority of regional investment (SPI 38) and is the second-best *comuna* ranked, reaching 20,000 ML of bike lanes. According to this ranking, *comunas* with the highest number of bicycle lanes built in 2012 were Santiago (SPI 43), Puente Alto (SPI 38) and Ñuñoa (SPI 47). However, when linking the length of LM of bicycle lanes per *comuna* and per 100 residents, La Reina (SPI 48), Santiago and Ñuñoa (SPI 48) *comunas* lead the ranking, as shown in Figure 5.2 (Saud, 2014).

Regarding the significant difference of LM of bicycle lanes between *comunas* in Santiago, these data also raise questions about the distributive dimensions of promoting cycling, visualising to whom such a public policy is addressed and how it is implemented in practice (Chapters 6,7 and 8). As a matter of sub-national institutions, these results express that the distribution of this infrastructure follows a self-organized municipal pattern that does not necessarily correspond to the regional needs, especially when looking at the SPI indicator (Table 5.1). Indeed, according to this information, there is no direct relationship between the length of LM of bicycle lanes and the population density per *comuna* (Figure 5.6). Furthermore, this is also an expression of self-organized municipal practices with little effective regional coordination, despite the regional efforts to coordinate this sub-national investment. This dissociation was partly due to the fact that bike lane initiatives emerged from the capacity of each municipality to directly generate its own investment or to leverage resources to obtain regional funds. In practice, the formulation of such projects involves high financial costs and professional capacity, together with a recent update of the methodology for social assessment on bike lanes (Ministry of Social Development, 2013), which required high dissemination and professional capacities for its implementation. For this reason, several public institutions

joined together in a commission in charge of formulating norms for the design and construction of bicycle lanes, meaning an instance of support to the municipalities for the formulation of projects at regional level, and thus achieving an integrated vision for bike lanes distribution within the region. As an instance of this, I was part of this commission as an investment analyst of the Metropolitan Regional Government of Santiago (Ministry of Housing and Development, 2015a; 2015b)[4].

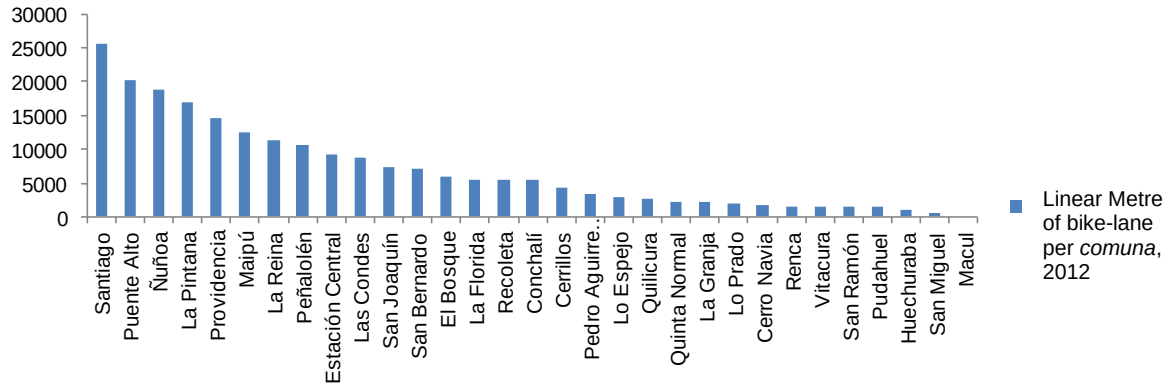

Figure 5.5: Linear metre of bike-lanes in *comunas* of Greater Santiago, 2012. Source: Retrieved from Saud (2014).

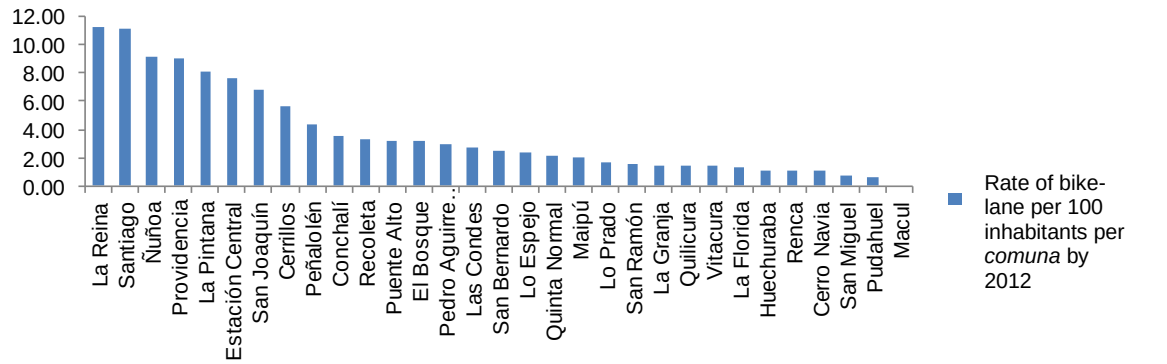

Figure 5.6: Ranking of *comunas* of Greater Santiago and rate of linear metres bike-lane per 100 inhabitants by 2012. Source: Retrieved from Saud (2014).

4 Both manuals are currently being updated, however, for details see https://www.gob.cl/noticias/ciclovias-descarga-y-conoce-los-manuales-de-diseno-y-construccion/

In terms of planning instruments to coordinate public investments in bike lanes in Greater Santiago, the Master Plan for Cycle Routes 2012-2020, carried out by the Santiago Metropolitan Region Government and SECTRA, defined 800 km to be built by 2020, including implementation stages. The definition of these stages was based on criteria for prioritizing the projected sections: priority by type of road, physical feasibility, and demand observed in terms of current flows. The total masterplan implementation was scheduled for the year 2022 with regional public funding, with an updated assessment methodology developed by the Ministry of Social Development. However, it is evident that the difficulty in materializing such a plan lies in the real possibility of the municipalities to leverage these resources since these projects must be financed locally, considering that their development is costly and requires specialized personnel in charge of their management and evaluation.

In conclusion, Santiago shows a high dispersion and disparity of bike lane distribution, expressing disparities in terms of the areas of Santiago where cycling is being promoted through support for infrastructure investment, both intra-*comunal* and inter-*comunal.* Against this backdrop, route options are restricted to road and pedestrian areas, as findings in Saud (2014) showed. As a matter of institutions, disparities are also an expression of the poor coordination between sub-national levels, a consequence of the high degree of centralism that characterises the institutional setting in Chile. This deficit arises mainly from self-organized municipal practices (Chapter 4). Indeed, these data show that many of Santiago's bike lane initiatives have a *comunal* scope, as investment decisions are made at the municipal level, and the *comunal* territory is administered autonomously by each municipality.

While the need for this infrastructure is not disputed, neither the autonomy of each *comuna,* there is a need for creating horizontal inter-governmental agreements avoiding potential top-down relationships that could influence the accessibility and perceptions of the benefits to promote cycling and active travel in Santiago. In addition, talking about linear metres or kilometres of bicycle lanes also requires considering the physical characteristics of what has been built and what is planned. Indeed, at the time of the BSS planning process, this incipient period of the bicycle boom showed an absence of standard design for bike-lanes (Saud, 2014).

5.2.3.3 Current characterization of cyclists in Greater Santiago – an institutional perspective

This sub-section summarises the results of two relevant studies characterising cyclists in Santiago at the time of BSS deployment. The first one is the 'Analysis and evaluation of the master plan for bike-lanes in Greater Santiago' developed by the Metropolitan Regional Government of Santiago and the Secretariat of Transport, Ministry of Transport and Telecommunications (SECTRA) in 2013. This corresponded to a national level decision to implement such infrastructure, contained in the Master Plan for Cycle Routes in Greater Santiago 2012-2020.

The second document is comprised of the 'Feasibility Study and Management Model for the implementation of Public Bicycles' developed by the Regional Government of the Metropolitan Region (Santiago Metropolitan Region Government, 2012), which offers relevant data associated with the characterization of potential BSS travellers, in the context of promoting cycling at the regional level. 'Analysis and Evaluation of the Master Plan for bike-lanes in Greater Santiago 2012-2020' (SECTRA, 2013b). This study conducted a survey of bicycle users in the 34 busiest *comunas* of the Metropolitan Region as a part of the Master Plan of bike-lanes of Greater Santiago 2012-2020. This survey was conducted in the different *comunas* of the city according to the distribution of bicycle trips attracted by each *comuna* on working days and by considering those places with the highest levels of cyclist flow. This survey reached a total of 640 respondents. For the present research, the following measurements are considered relevant for a characterization of cyclists: the characteristics of their trips, reasons for using the bicycle, the alternative means of transport available, cycling behaviour and the perceived safety of the mode.

i) 'Analysis and evaluation of the master plan for bike-lanes in Greater Santiago' (SECTRA, 2013)

In terms of trips made by the cyclists surveyed, this study showed that the highest number of trips is made at intra-*comunal* level, as is the case of trips in Puente Alto *comuna,* with 5.3%, Providencia with 3.6% and Maipú with 3.1%, according to the distribution of total trips. Those *comunas,* except for Providencia, are a medium-low priority of regional

investment and located on the outskirts of the city, which is 20 km from the city centre (Figures 1 and 5). Regarding inter-*comunal* trips, the areas with the highest bicycle trip generation were the following *comunas* grouped by proximity: Conchalí-Independencia with 1.8% of total trips, Quinta Normal-Estación Central with 1.4% and Pudahuel-Lo Prado with 1.3%, which correspond to less advantaged peri-central *comunas* located at the north-east area of Santiago. Figure 5.7 shows the percentage of trips generated and attracted by *comuna.* In this regard, the main *comunas* that concentrate bicycle trips both origin and destination were San Bernardo, Santiago, Puente Alto, Pudahuel and La Florida, both in origin and destination corresponding to peri-urban *comunas* in Santiago, meaning those are closer to the rural boundary. It is noteworthy that these *comunas* are the ones that concentrate the largest amount of *comunal* population at the national level. Figure 5.8 plots respondents' trips, both intra-*comunal* and inter-*comunal.* Trips have been differentiated according to the length of red lines representing the movements of the longest trips (more than 10 km) and in green the shortest ones (less than 2 km). This figure shows the presence of long trips generated by origins and/or destinations from the peri-urban *comunas* of the city.

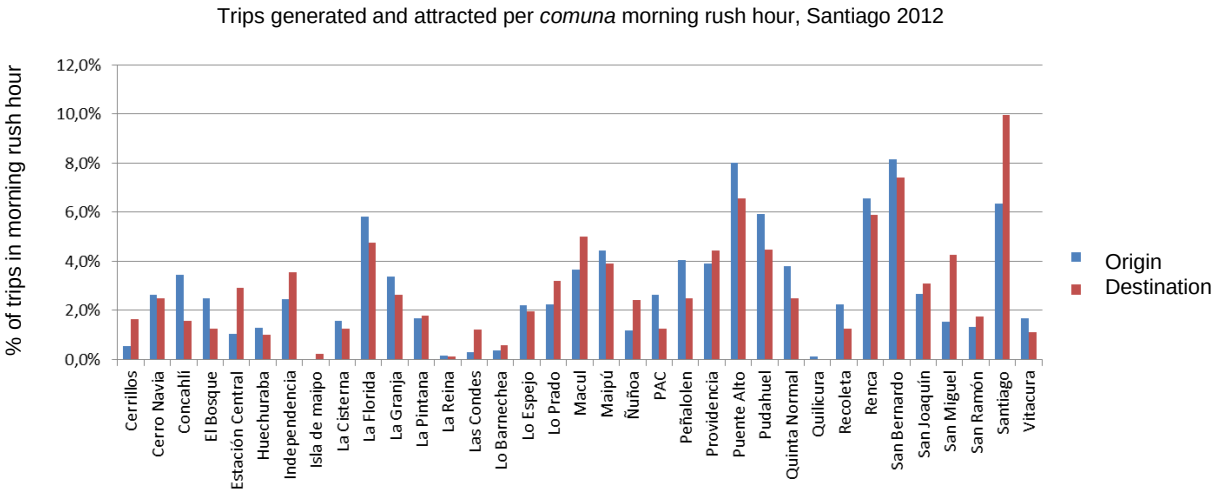

Figure 5.7: Proportion of trips generated and attracted per *comuna.* Source: Adapted from SECTRA (2013b)

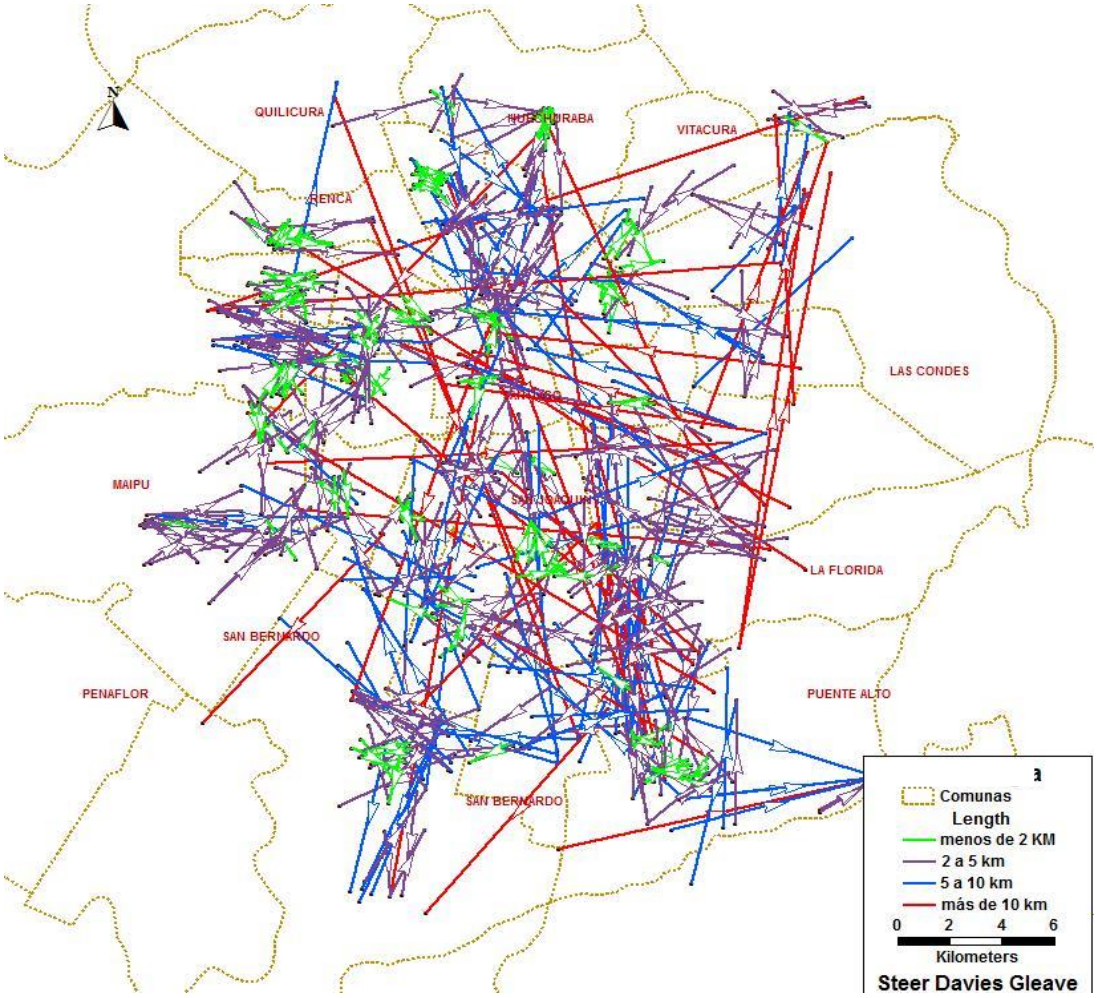

Figure 5.8. Origin-destination of trips by bicycle in Greater Santiago, 2013. Source: SECTRA (2013b)

Cyclist characterization

Out of a total of 640 respondents, 16% were women and 82% were male. Regarding the age range, 53% of surveyed cyclists are aged between 26 and 45 years old, as shown in Figure 5.9, and 6% of cyclists were aged 60 and over. Regarding their occupation, cyclists were mainly dependent workers, with 66% and 12% of them were students. In relation to the level of education, 61% declared having a high school education and 21% reported having higher education, as in Figures 5.11.

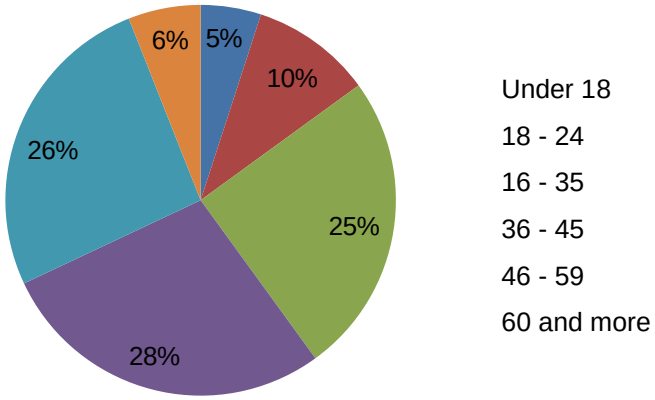

Figure 5.9 Age of bicycle users in 2013. Source: SECTRA (2013b)

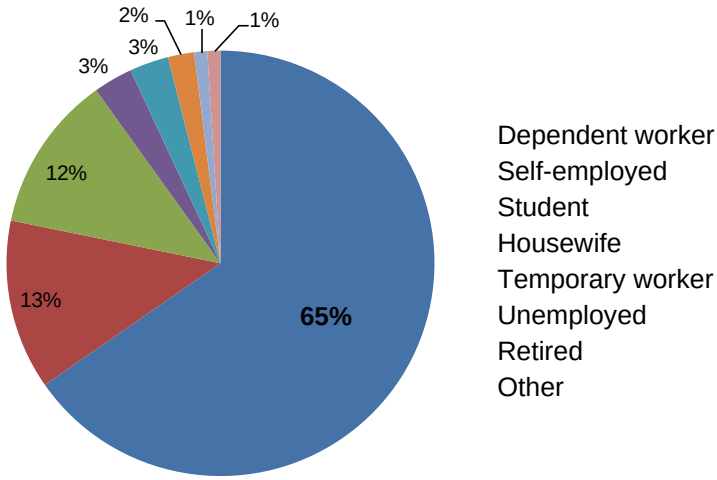

Figure 5.10: Occupation of the bicycle users in 2013 Source: SECTRA (2013b)

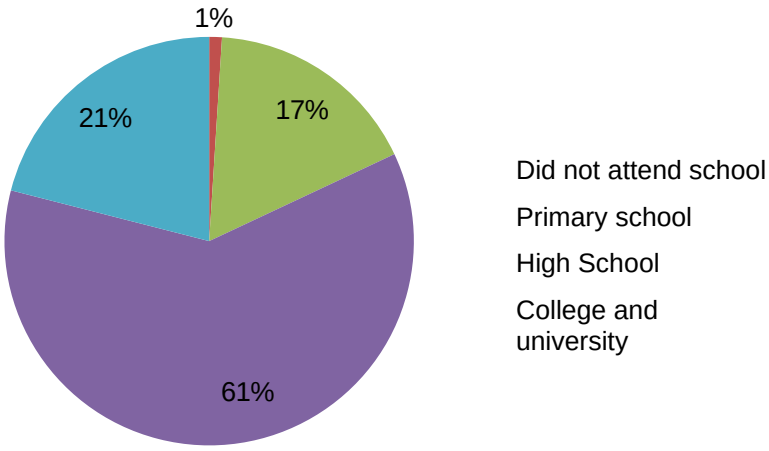

Figure 5.11: Cyclists' levels of education, 2013. Source: SECTRA (2013b)

Travel time by bike in Santiago

The average journey time for cycling was 29 minutes by 2013. 68% of the trips had a duration of less than 31 minutes. Figure 5.12 below presents the share of trips by duration. The red line presents the sums in relation to the described categories.

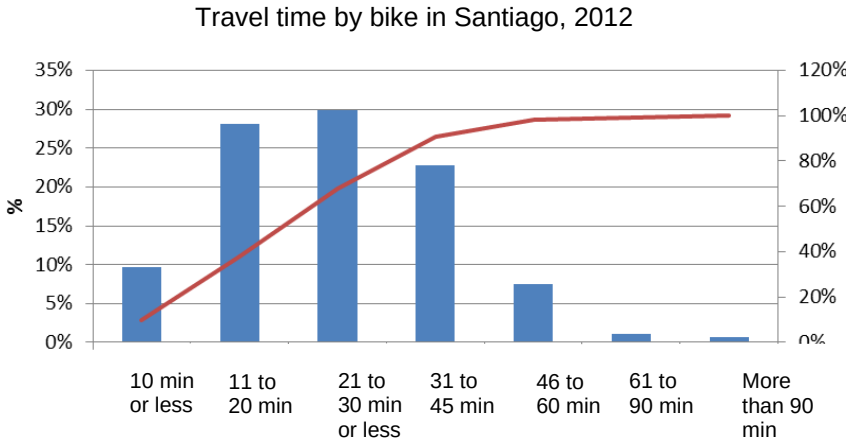

Figure 5.12: Travel time by bicycle, workday peak morning (PM), 2013. Source: SECTRA (2013b)

Reasons for cycling

86% of the respondents declare using the bicycle for utility purposes, that is for essential trips such as commuting. Regarding the reasons for cycling, 45% of users stated that the most important reason is that it is cheaper, while 28% stated that they use it to save time. Regarding the alternative means of transport available, 83% of those surveyed stated having no car to make a similar trip, 68% stated that if they could not make the trip by bicycle, they would use a bus, and 15% said they would walk. Regarding the previous means of transport used a year prior to making the similar trip, there was a significant modal shift from public transport bus to bicycle, corresponding to 32%.

Perception of safety

The cyclists' perceptions of safety are directly related to the infrastructure on which they ride. When users ride on a bicycle lane, the perception of safety is greater than when they ride on another type of road, a perception mainly associated with accidents. It was also noted by cyclists that they felt more insecure in terms of crime (e.g. being assaulted) than accidents. The perception of safety, in the event of accidents, was 5.9 on a bike lane versus 4.4 on routes without it, considering a 1-7 (1 very unsafe, 7 very safe) Likert scale point, as shown in Figure 5.13. Numbers at the top of the bars show the average percentage.

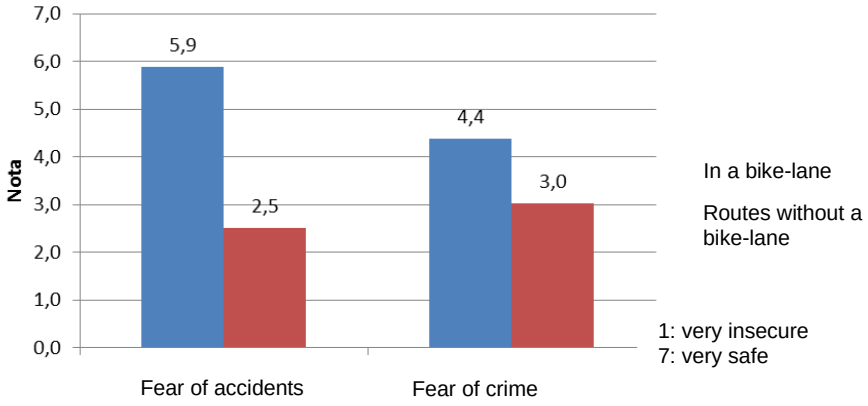

Figure 5.13: Perception of safety travelling by bike in Santiago, 2013. Source: SECTRA (2013b)

Figure 5.14 shows the perception of safety on and off a bike-lane by gender, in the event of acts of vandalism; 18% of users give a score of 7 when cycling on bike-lanes, while 33% give a score of less than 4. In relation to the perception of safety according to gender, there are slight differences. However, women give a higher evaluation than men when cycling on bike lanes and a lower score when cycling outside cycle lanes, which shows that there is a gender gap that needs to be addressed in public policy.

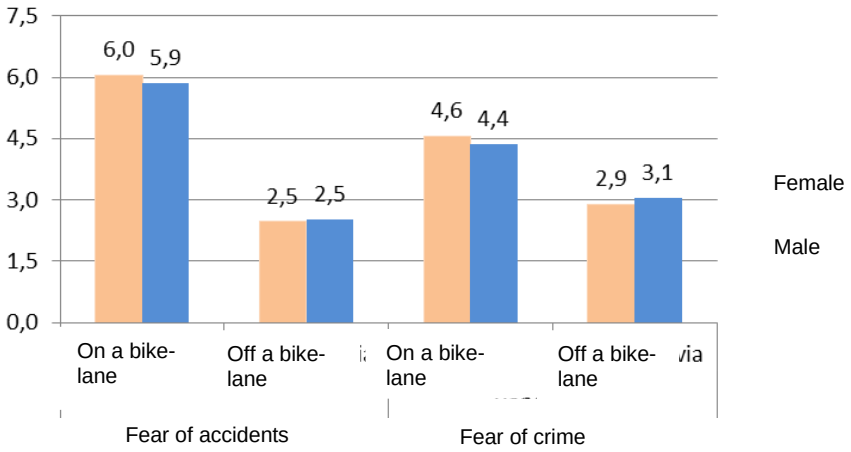

Figure 5.14 Average score for sense of safety by gender, 2013. Source: SECTRA (2013b)

Main results

According to the survey of the study 'Analysis and Assessment of the Master Plan for Cycle Routes in Greater Santiago 2012-2020' (SECTRA, 2013b), cyclists in Santiago in 2013 were mainly men (82%), aged between 26 and 45 years (53%), with high school (61%) and they were mainly dependent workers (66%), as in Figure 5.11. They used bicycles as a means of transport to get to work or school (86%), and a significant proportion of them (32%) replaced public transport with bicycles as a means of transport. The trips made by bicycle in the morning peak period are mainly for commuting purposes. The main reasons for cycling are mainly economic (it is cheaper) as well as time-saving reasons. The highest concentration of trips was made by peri-urban and dense *comunas* in Santiago. With regard to the perception of safety when cycling, users feel more fear of crime rather than of accidents, with gender differences. This perception of insecurity is greater when cycling in places other than bike-lanes and is slightly greater in women than in men.

I) 'Feasibility Study and Management Model for the implementation of Public Bicycles for Greater Santiago' (Santiago Metropolitan Regional Government, 2012)

This study was carried out by the Santiago Metropolitan Regional Government in the planning process of the first *inter-comunal* BSS in Santiago. Further details are given in Chapter 6. The relevance of this study in the context of this chapter is to highlight the rationale for determining the profile of a potential user of the system. For this regional study, a survey was carried out collecting a total of 620 responses comprising disparate groups of people in different sectors of Greater Santiago, differentiated into two main groups: those who travelled by public transport (assuming the key actors in a model transfer towards a BSS cyclist), and current cyclists, comprising both current users of the *comunal* BSS existing at that time in Providencia (assuming a scenario of service continuity) and general cyclists in Santiago, considering all socio-economic strata between 18 and 60 years of age, residents of the Metropolitan Region.

It is important to note that, at the time of the development of this study, there was a local BSS in Providencia *comuna.* It comprised 150 bicycles and 15 stations and consisted of a manual system, controlled by the municipality but privately operated. With a contract expiring at the end of 2012, this local government aspired to be part of a system that transcended *comunal* boundaries.

Returning to the regional study, one of the most relevant aspects of this study was to determine the willingness to use a BSS in Santiago. 70% of respondents said they would be willing to use a BSS as a complement to their usual transport in the city, as shown in Figure 5.12. The reasons stated for using a BSS when it is deployed were time-saving, money-saving and physical activity, according to this study. For public transport users, 65% said they were aware of what a BSS meant, and 68% of the respondents indicated their intention to use it. 32% would not use it, mentioning the lack of bicycle lanes and safety reasons. Other reasons were using their own bicycle, the preference for another means of transport and distances of trips. Although some respondents stated that they would continue using their own bicycle, 73% would be willing to use a BSS, with time-saving as the main reason, fitness as the second most important reason, followed by saving money and environmental protection as the third main reason.

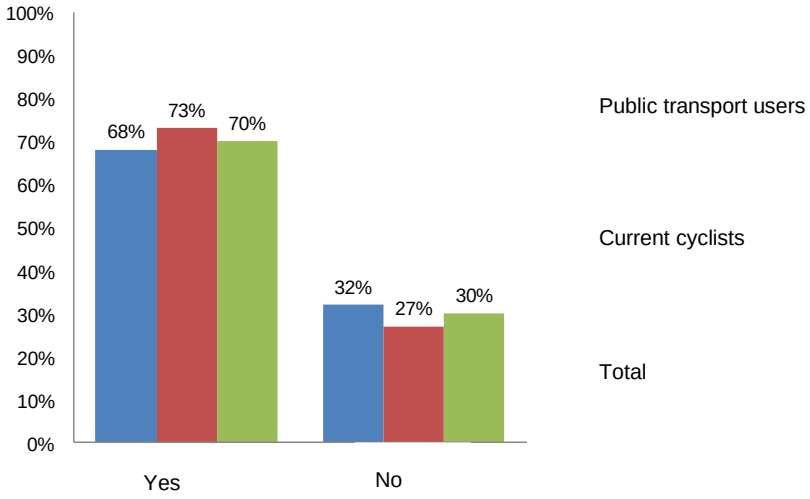

Figure 5.15: Willingness to use a BSS in Santiago. Adapted from Santiago Metropolitan Regional Government, 2012.

In relation to the answers given by the users of the local system in Providencia, 80% of them were composed of young people between 21 and 36 years of age, distributed evenly between genders. The main reason given to continue using the system was commuting, also mentioning it was very useful as a complementary means of transport for this purpose. 45% of them stated that they would use public transport for their current trip if they did not use the current BSS. The level of satisfaction with the existing BSS in Providencia was also measured in the regional study on a rating scale of one to five Likert scale point (1 very good, 5 very bad). The best score was 3.2, associated with the price of the service. In second place was the attention of the staff at the dock station, with a score of 3.1. In third place was the availability of bicycles with 2.8. The lowest scores were associated with the degree of information on bicycle use, followed by the behaviour of motorists, the behaviour of pedestrians towards cyclists, and the low number of bicycle lanes and poor connectivity as external factors. The direct implications of mobility justice transition research suggested in this chapter regarding travels patterns, public policies and cycling are linked in greater detail in Chapters 6, 7 and 8.

Chapter 6. Analysis of early decisions to deploy the first inter-*comunal* BSS in Santiago

This chapter seeks to provide an understanding of the institutional rationale behind the BSS regional business model as a planning tool to deploy the first inter-*comunal* BSS in Santiago in order to analyses its role in triggering a mobility justice transition.

In particular, this chapter provides an understanding of the underlying values and principles embedded in the regional business model for potential decision-making scenarios to deploy the BSS in Santiago. Two sub-national administrative levels - the local and the regional level in Santiago– comprise the focus on this sub-national research, considering Santiago as a context of high socio-economic segregation.

Two parts comprise the present chapter. The first part of the analysis comprises an examination of documents related to the initial process of the BSS deployment. It analyses key assumptions made in the 'Feasibility Study and Management Model for the implementation of Public Bicycles for Greater Santiago' (Santiago Metropolitan Regional Government, 2012). This analysis is preceded by a governance and policy background. It is important to note that this source as a planning tool was developed as a business model in practice, according to the public records reviewed. Furthermore, this regional study is part of my personal work experience as an investment analyst in Santiago Metropolitan Regional Government between 2011 and 2015. As mentioned in Chapter 1, I was responsible for coordinating different policies and public investment to encourage non-motorised means of transport. In this regard, I was in charge of elaborating the requirements for funding this study, developing the terms of reference for the hiring of a consultancy and, subsequently, evaluating its content. This chapter also constitutes an empirical reflection of the work I carried out there, which allowed me to gain perspective on the assumptions under which investments are made in Chile. In doing so, the focus of this analysis is on the assumptions made about how private and public values were formulated and the role of these in a potential transaction for this technological deployment. It would consider Santiago as a context of 'enabling state' action that creates an 'enabling environment' as a hybrid way of allocating and leveraging resources (Carroll,

2012), more related to forms of governance management and negotiation. Therefore, the business model analysis becomes relevant as a planning tool in such contexts.

The information is grouped on the basis of the three key components of the business model innovation framework: i) value proposition, ii) value creation, and iii) value capture (see Chapter 4). Thus, this analysis examines the regional business model rationale for creating, providing, and capturing economic and public values, guided by two questions: What values are implicitly and explicitly proposed through the BSS implementation in Greater Santiago and for whom? What was the purpose and role of the business model developed by the regional government to implement a BSS?

The second part of the analysis introduces the public tendering of the BSS, particularly disaggregated by the *comuna,* date of tender, projections basis, and general aspects comprised in the resulting technical offer to provide a detailed overview of the BSS deployment process.

The analysis concludes by determining the role of the regional business model in both reproducing and challenging socio-spatial inequalities in order to understand how this initial stage of decision making influenced the configuration of a transition towards more socially inclusive and fairer transport landscapes. This is possible by integrating the different analytical chapters (Chapter 6,7 and 8) at the end of Chapter 8, in the light of the various sources of information used here. This is an expanded work presented in Saud and Thomopoulos (2021).

6.1 Pre-deployment background

By 2011, the national government in Chile had the intention of promoting utility cycling or bicycle use as a formal means of transport to reduce the increasing rate of motorisation (see Chapter 5). Thus, the regional and local public levels became more aligned to achieve this national goal, especially by supporting bike-lane and cycling facilities investments across the region. In addition, Providencia *comuna* had already deployed a local BSS, in operation from 2008. However, its contract was due to expire, and the local desire was to constitute a system that went beyond the *comunal* scale. Thus, the deployment of the BSS in Santiago began in 2011 with the regional executive in turn

prioritising public resources to guide the decision-making process. The investment decision was materialised through a feasibility study, which comprised a business model, as the argument in the public document shows:

> From the point of view of promotion, one of the most appropriate examples for the government's goal of increasing the participation of the bicycle within the modal split of transport in Santiago... is through the provision of a System of Bicycle Concessions in Greater Santiago, strategically giving an impulse to the use of the bicycle as an alternative means of transport, and thus increasing its participation within the modal distribution of transport. To do this, it is required to carry out a market study in the first instance, which will indicate the specific characteristics that will have an impact on the implementation of the initiative, the detection of the most suitable alternatives and, in general terms, the relevance of the proposal for its implementation (National Investment System, 2011).

In addition, the explicit characteristics of the business model are recognised in the tendering process regarding the expected outcome, as an argument to a regional investment decision:

> A market research aims to ratify the real possibility of implementing the initiative through knowledge of the information that will impact on the structure of the initiative. Also, to determine the magnitude of demand and the characteristics of the potential users, as well as the orchestration nodes (both of those detected within the preparation of the proposal and key actors within the operation of the initiative), among others (Ibid).

The methodological proposal in the public bid listed several components to developing a regional study: current and potential users, sponsors, as well as a market. It also included the characteristics of the key actors in the implementation and operational levels. After a tendering process led by the regional government of Santiago, a firm was hired to develop the regional study as a blueprint to understand the BSS industry worldwide and its formulas, as can be seen in the following quote:

> ...'[Santiago Metropolitan Regional Government] has taken the initiative to promote a project to implement a public BSS, precisely in order to fulfil its institutional mission… For this purpose, a consultancy was invited to resolve the natural questions of any initiative. In fact, before implementing any undertaking, three basic questions must be answered: where are we, where do we want to go, and how are we going to get there? That is why initially it was necessary to establish a diagnosis of the BSS in the world in order to solve the basic concerns that arise when trying to implement a similar system in Chile' (Santiago Metropolitan Regional Government, 2012:15).

As the BSS in Santiago originally pursued the regional institutional mission of “ensuring harmonious and equitable development” by implementing the BSS at the Santiago Metropolitan Regional Government (2012:15), the analysis of the institutional rationale

becomes crucial to understand how this institution defines and address public and private values, to whom and by whom, especially considering the context of Santiago which presents a high socio-economic segregation (PNUD, 2017).

6.2 A bike-sharing regional business model

As further discussed in Chapter 4, a business model describes the rationale of how institutions and different "organisations create, deliver and capture values" (Osterwalder and Pigneur, 2010:14) through an intervention such as the first inter-*comunal* BSS in Santiago. Since Santiago Metropolitan Regional Government financed the 'Feasibility and Management Study of a Public Bicycle Concession for Greater Santiago' (the regional business model), which comprised a private and social assessment, the present analysis focuses on how Santiago Metropolitan Regional Government defined how institutions and organisation might create, deliver and capture values through the BSS deployment comprising the analysis of 34 urban *comunas* – Greater Santiago. Thus, this analysis examines the regional business model rationale for creating, providing, and capturing economic and public values as a key component of the present analysis. Table 6.1 summarises the main topics developed and grouped by these categories.

Table 6.1: Overview of the business model analysis. Source: Own elaboration based on Bocken *et al.* (2013).

Analysis of the regional business model	
A) Value Proposition	An alternative and sustainable means of transport for greater Santiago to reduce congestion and pollution
B) Value Creation	Sponsorship-based and a private – public institution managing the implementation
C) Value Capture	Two different membership schemes, free public space concession and a subsidy

6.2.1 A value proposition design for the first *inter-comunal* BSS in Santiago

Value proposition, which is further developed in Chapter 4, is considered in this analysis as a 'bundle' of benefits that a service provides to citizens to solve a need. In doing so, it comprises the relationship between key actors exchanging values to solve a need for a

selected population (Ludeke-Freund, 2013; Osterwalder and Pigneur, 2010). Likewise, when promoting the bicycle as a means of transport through a Bicycle Sharing System (BSS), many urban, economic, and societal values have been highlighted in the literature about BSS worldwide. Indeed, the broad literature recognises that such systems offer significant contributions to cities and people. Promoting physical activity, reducing pollution, discouraging car use, reducing congestion, family recreation, reducing obesity, encouraging local tourism and promoting community development are the main contributions discussed (Pucher, Dill and Handy, 2010; Zhang et al., 2015; Pucher et al., 2016 among others). Thus, the present analysis of the value proposition places the focus on the spatial coverage proposed in the regional business model, comprising several principles regarding the built environment and socio-demographic factors.

6.2.1.1 Spatial coverage proposition

Spatial coverage is a complex variable when examining the deployment of a docking station BSS in the metropolitan area of Santiago pursuing an objective such as offering an alternative and sustainable inter-*comunal* means of transport. How, by whom, and to whom are those values addressed? An analysis of the spatial criteria to define these attributes sheds light on helping elucidate the Regional Government rationale when selecting the areas in which to allocate the BSS docking station. According to the literature on bike-sharing (Chapter 3), decisions on spatial coverage are based on a set of assumptions regarding the quality of the built environment and mixed land-use, thus applying a recipe disseminated by the bike-sharing industry worldwide:

i) multi-modality -or those areas with other means of public transport
ii) centrality -or those areas that attract trips.
iii) inter-*comunality* -or a network to connect *comunas* across the region.

All of these principles refer to the current travel patterns, and mixed land uses as an inherent dominant industrial condition. Consequently, a total of seven ‘standards’ were developed to assess the 34 *comunas* comprised in Greater Santiago. These standards or variables were: i) size of population (resident and floating5), ii) stock of shops and services, iii) Metro stations per km2, iv) trips per *comuna* / day (all means of transport),

5 The regional business model defined the ‘floating population’ as those who travel to the selected areas for study or work purposes; however, they do not necessarily live there.

v) topography, vi) km distance of bike-lanes, and vii) number of incidents of vandalism and crime reported. These variables, pointed out as fundamental for the success of these systems, were introduced in the business model by means of the Delphi method or a prospective technique based on an expert panel assessment. The methodology in the regional study weighted each factor in relation to the attractiveness of trips in each *comuna,* as in Table 6.2. After discussing the degree of equivalence and relevance of these factors for the BSS implementation in Santiago, topography and crime were eliminated. The rest were grouped by three key concepts, centrality, inter-modality and inter-*comunality.* Indeed, Santiago is a flat city, with a 3% slope in its urban area. Thus the topographical factor would not influence the willingness to use this service. The crime factor penalised attractive *comunas,* since these reported crimes included those related to a lower amount, arguing that the perception of security had a local scale. Thus, the concept of centrality comprised population (floating) and stock of services, while inter-modality measured the existence of Metro stations and bike-lanes in each. Inter-*comunality* (proximity) considered trips attracted per *comuna,* as in Table 6.3.

Table 6.2 Initial variables to locate the network of BSS docking stations. Source: Retrieved from Santiago Metropolitan Regional Government (2012)

Indicators	Weight
Size of population	20%
Metro stations per km2	20%
Topography	20%
Bike-lanes	15%
Trips per *comuna* / day	10%
Stock of shops and services	10%
Vandalism and crime	5%
Total	100%

Table 6.3 Regrouping and weighting of variables to locate the network of BSS docking stations. Source: Retrieved from Santiago Metropolitan Regional Government (2012).

Category	Weight
Centrality	55%
Inter-modality	35%
Inter-comunality (proximity)	10%
Total	100%

These indicators were applied as a ranking, rating each *comuna* by a 1 to 7 scale to assess and prioritise a network of dock stations, creating a list of prioritised *comunas* that 'achieved' the best score. Therefore, the first nine more highly ranked *comunas* constituted the initial 'plan' for estimating the size of the system, as shown in Table 6.4. Hence, the number of stations per *comuna* was decided when meeting two key criteria: density of transport services, in particular Metro stations, and kilometres of bike lanes. Likewise, a similar filter was applied at the *comuna* scale to define the location of the docking stations, in addition to those areas when current traffic flows converge.

The nine best-ranked busiest *comunas* across Greater Santiago comprised an initial plan to deploy the system, estimating a total of 105 stations and 2,100 bicycles, as in Table 6.5 and Figure 6.1. This estimation projected demand of 2,815,551 floating population in the busiest areas of the city, where the vast majority are wealthy central and peri-central *comunas.*

Table 6.4: Ranking derived from the regional business model for implementing the BSS. Source: Retrieved from Santiago Metropolitan Regional Government (2012)

COMUNA	RANKING	Score	*COMUNA*	RANKING	Score
Santiago	1	6,1	La Reina	18	1,2
Providencia	2	3,8	Peñalolén	19	1,2
Las Condes	3	2,9	P. Aguirre Cerda	20	1,1
Ñuñoa	4	2,8	San Ramón	21	1,1
Macul	5	2,4	La Granja	22	1,0
Lo Prado	6	2,0	Vitacura	23	1,0
Recoleta	7	2,0	Huechuraba	24	0,9
La Florida	8	1,8	Cerrillos	25	0,8
San Miguel	9	1,7	San Bernardo	26	0,8
Maipú	10	1,6	Pudahuel	27	0,8
Puente Alto	11	1,5	Cerro Navia	28	0,7
Estación Central	12	1,5	Lo Barnechea	29	0,7
San Joaquín	13	1,4	Quilicura	30	0,6
Quinta Normal	14	1,3	El Bosque	31	0,6
Independencia	15	1,3	Lo Espejo	32	0,5
Conchalí	16	1,3	Renca	33	0,5
La Cisterna	17	1,3	La Pintana	34	0,5

Table 6.5: *Comuna*s listed in the ranking developed by the regional business model for implementing docking stations. Social Priority Index, position 52 to 1, from no priority of public investment (wealthiest areas) to high priority of public investment. Source: Retrieved from Santiago Metropolitan Regional Government (2012) and Ministry of social development (2017).

*COMUN*A	SPI Position	Floating population covered	No. of docking stations
Santiago	43	995,338	26
Providencia	50	582,363	13
Las Condes	51	647,418	19
Ñuñoa	47	132,414	12
Macul	45	52,896	6
Lo Prado	13	129,185	10
Recoleta	19	10,969	4
La Florida	40	135,318	5
Maipú	41	129,650	10
Total		2,815,551	105

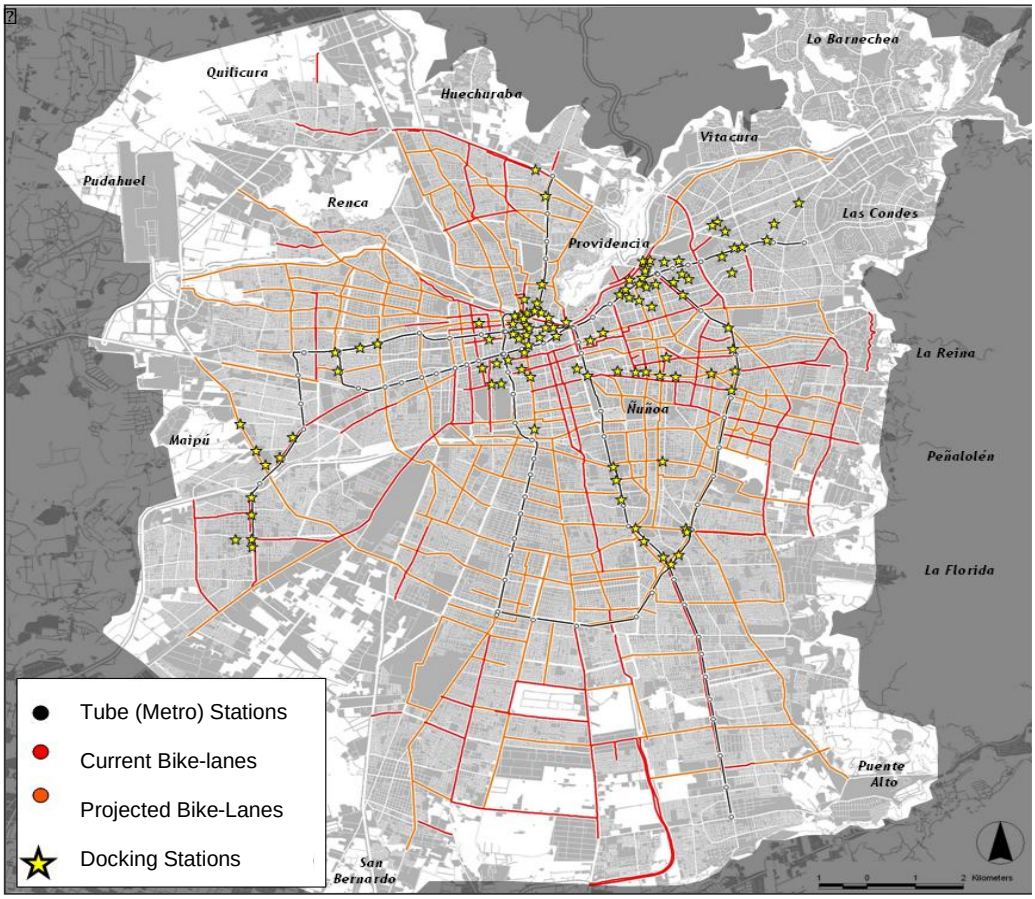

Figure 6.1 Inter-*comunal* BSS in Santiago. Dots in yellow show proposed docking stations according to the regional business model. Source: Retrieved from Santiago Metropolitan Regional Government (2012).

6.2.1.2 Beneficiary population

The business model proposed three types of potential users, as further explained in Chapter 5. First, Providencia's current local BSS users were considered as part of the beneficiary population. Second, cyclists using their own bikes were considered to explore user's willingness to replace and/or complement a trip by using a BSS. Third, current public transport users were assumed as incorporating or shifting the BSS in their trips. This proposal of potential users shows that the assumptions of the data collection followed a conventional transport planning rationale since this tool of planning considered the current bicycle and public transport users as promoters of the expected change in terms of reducing vehicle occupancy rates in Santiago. However, there is no concrete measure in this study to incentivise car replacement. Likewise, this proposal was also in line with a profile of a place of residence near the busiest areas, and/or working there, travelling by public transport or by active travel, and/or who commutes by private bike towards the busiest area of Santiago, replicating conventional transport frameworks to assess a public investment. In accordance with the SPI, those *comunas* where the system was located have a greater capacity to leverage public resources to effectively improve their public space, as in Figure 6.2.

Location of the sample

★ Public Transport users

1. Metro Universidad de Chile, Santiago
2. Gabriela Mistral cultural centre
3. Metro Tobalaba
4. Metro Bilbao
5. Metro Irrarazaval
6. Metro Bellavista de La Florida

★ Current cyclists

7. Alameda bike-lane, Santiago
8. Pocuro bike-lane, Providencia
9. Americo Vespucio, Las Condes
10. Vitacura bike-lane, Vitacura
11. Duble Almeyda bike-lane
12. Vicuña Mackenna bike-lane (La Florida)
13. Pajaritos bike-lane, Maipu

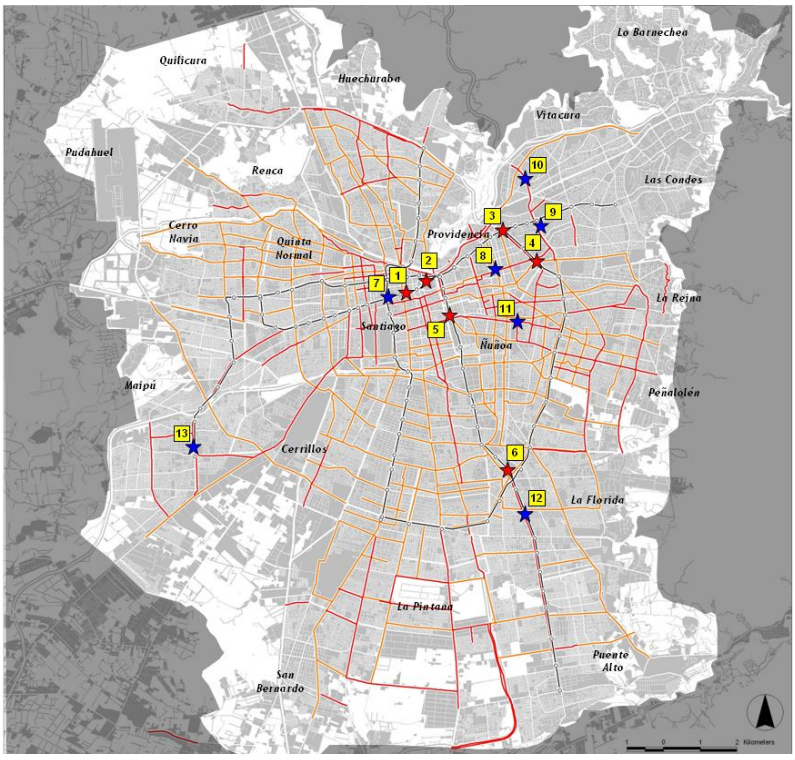

Figure 6.2: The Inter-*comunal* BSS in Santiago. Dots in red/blue show users sample location in Metro stations and busiest bike-lanes by *comunas*, as in the regional business model. Source: Retrieved from Santiago Metropolitan Regional Government (2012).

Thus, the value proposition comprised a docking station-based BSS in support of the existing public transport network, aiming to reduce the high levels of car occupancy in Santiago. With the first phase of implementation in the nine best-ranked and busiest *comunas* across Greater Santiago, following the conventional criteria to locate such a network, a total of 105 stations and 2,100 bicycles was estimated. Therefore, this tool of planning is an expression of a mechanism that benefits those groups who live in areas with more facilities.

6.2.2 Value creation and value capture to deploy a BSS in Santiago

Value creation and capture in the BSS in focus comprised an overlapping, imbricated network of key partners and public-private strategic negotiations to offer a private operator the best conditions to secure an attractive financial return. In doing so, the business strategy rationale for implementing the inter-*comunal* BSS in Santiago assumed the following three key principles: a private operator taking over the operation via advertising, a profit formula under conventional access (subscription fee scheme) in conjunction with a public subsidy. Hence, a sponsorship-based business model via an advertising-funded plan was the 'ideal' scenario of key partners assessed to deploy the BSS. As the cash flows show (see Table 6.6 and Appendix C) by aligning and providing the best ideal conditions assessed, the minimum expected (private) returns over a period of 10 years would be achieved. In doing so, while the designed model positioned the private sector fully in charge of the BSS deployment, the state assumed an 'enabler' role, supporting the argument that the public sector lacks the capacity and knowledge to operate such a system.

> It is common when observing how regional governments or other government agencies have financed a BSS implementation (elsewhere) in other countries. The operator is fully focused on financing the operation… it seems to be the solution for the BSS success. However, the main failure is not regarding the cost but the degree of use of the system. Therefore, one way to improve the BSS profitability is by increasing daily use…. what is relevant is to create the conditions that allow the system to be viable before its implementation, otherwise, the project becomes a failure, even if the objective is profitable from the viewpoint of a social assessment (Santiago Metropolitan Regional Government, 2012:3).

Likewise, the business model sought a financial and regulatory strategy that allowed – under the rationale, this was to be as free as possible - a fully private self-financing scenario, following the decision made to capture resources:

> Having contextualised the macro-organisation of the system and having defined a business model based on a DBOMF scheme, that is, designing, building, operating, maintaining and financing with its own resources and eventual contributions from the state, then the specific business model that will manage the commercial relationship of the operator with each of the nodes (or participants in the execution of the project) will be designed. This will position those actors of the first order, in order to seek a mechanism that allows for self-financing, or in its absence, that minimises the impact of the subsidy that the state will need to promote so that the operator is encouraged to invest (Santiago Metropolitan Regional Government, 2012:239).

6.2.2.1 A free public space concession

A key urban governance challenge in creating the 'ideal' urban conditions when implementing the BSS scheme is the *comunal* public space negotiation for an eventual operation via advertising.

As explained in Chapter 5*, comunas* in Chile act as 'autonomous' administrative units. Thus, 'public goods', also known as National Public Goods[6] (NPG) or those goods that belong to all the inhabitants of the nation such as roads - becomes a crucial business strategy for negotiating the deployment of a unified inter-*comunal* system. In practice, each municipality is in charge of regulating the conditions for the exploitation of national public good, including setting the municipal fee, for example, allowing and providing conditions to exploit advertising in the public space, among other *comunal* duties (Chapter 4)[7].

Thus, the regional business model outlined a public-private strategic negotiation to offer a private operator the best conditions to obtain an attractive profit, under the premise that the exploitation of a national public good was given for free (or a free public space concession). This argument was that this would be the only possibility of financing the system, balancing revenues and costs under a marketing rationale. In addition, strong coordination between municipalities was required as a crucial governance matter to address a free public space concession in Santiago, and an institution in charge of such coordination was recommended to be created.

6 Art 589 Civil Code, Chile.
7 In accordance with the current Chilean constitution, this local level responsibility may be subordinated to national level decisions.

> (Street Advertising) is a crucial financial aspect of the project, because, without advertising, the system is not self-financing… Assuming that the municipalities will make it easier for the operator to obtain income from the exploitation of advertising rights on their national goods for public use, an innovative model could be considered, such as freeing the operator from the charge derived from advertising rights (Santiago Metropolitan Regional Government, 2012:246).

6.2.2.2 Revenue stream and cost structure

To further explain the business strategy proposed, the regional business model assessed three forms of revenue stream and cost structure. As is commonly the case with transport schemes, the first revenue stream assessed was a conventional membership cost, meeting the industry's recipe in accordance with similar access and fee structures worldwide. A survey conducted by the regional business model analysed the willingness of the population studied to pay, confirming similar results between the type of user examined in other case studies – Ciudad de Mexico, Paris, and Berlin – and their willingness to pay, which was reflected in the final membership cost defined for the service. For better private profitability, an estimation of the best return considered an extra revenue stream, based on an additional and differentiated service provision in some docking stations argued as a level of automation of the docking stations. This proposal of a mixed-system formula was designed for those stations located closer to public transport services in less attractive areas for a sponsorship-based scheme. It consisted of manual or staff-assisted docking stations in conjunction with valet parking of the private bicycle service, assuming a modal-shift from current cyclists arriving on their own bikes to use the BSS. Thus, this profit formula of a mixed system involved a type of revenue derived from an extra membership to use the system in these areas. Thus, one access was assessed through a manual station with staff assisting the bicycle collection and return, and one automatic through a card access service. Under this rationale, the initial plan estimated a total of 105 dock stations, with 40 automatic stations, and 65 manual stations

This shift, from an automatized to a manual scheme, however, is argued on the basis of a certain ‘idiosyncrasy in Chile’ (see the quotation below), linking the place of residence, purchasing power, and educational levels, with a ‘level’ of (previous) exposure to the technologies. Thus, some differences were recognised, applied as an extra fee to different users. Likewise, it was also argued that there would be a learning process in those areas to encourage and increase a ‘potential demand’; however, the core argument for this shift is to safeguard the investment in the

equipment. In this regard, it constitutes a proposal clearly oriented towards increasing private profitability via discriminating less advantaged groups under this institutional rationale. This argues a 'learning process' to introduce a 'top down' policy that benefits the private sector at the expense of potential users who live in areas farther away from the location favoured by a potential sponsor and who would be assumed to require a different membership given the socio-spatial conditions associated with the profile of these users, as the quotation below shows. Therefore, this is clear evidence of the social – spatial and governance inequality posed by Ostrom (1983).

> Regarding the level of automation of the dock stations, implementing a mixed system is recommended, due to the 'Chilean idiosyncrasy', that is, considering manual and automated stations. Indeed, automatic stations could be placed in areas with greater purchasing power and higher educational levels… on the one hand, (in those areas) they are more familiar with the technology, and they also have electronic payment. On the other hand, in areas with fewer resources and lower levels of education, manual stations assisted by human staff are recommended… to interact with and to instruct the users, and fundamentally to safeguard the equipment. This format also allows for the coexistence of a loan and private bicycle parking option, which can become mixed stations… Based on this suggested mixed operation – manual and automatic - considering 105 mixed stations, 40 automatic and 65 manual stations, and when considering 20 docks per station, a total of 2,100 bicycles were estimated (Santiago Metropolitan Regional Government, 2012:10).

6.2.2.3 A regional subsidy for the initial investment of the BSS

As the regional business model recommended a sponsorship-based model supported by a regional subsidy, a social assessment was also conducted to provide the required information and arguments to effectively subsidise the operator with the initial investment argued to start the BSS deployment. The assessment consisted of conventional social benefits as measured internationally. Four social benefits were quantified in Santiago: i) time-saving, ii) public health improvements, iii) benefits from reduction of environmental pollution, and iv) reduction of accident costs associated with increased bicycle usage. Hence, by quantifying all these benefits as an average in Santiago, the social return, or the pertinence of public investment, was estimated at 132,5%[8], thus justifying the allocation of public resources.

This social assessment for subsidising the initial investment, namely the system equipment, is argued in support which the investor obtains at least in the value of the investment made above the profitability required for implementing the system. The

8 Considering a discount rate of 5% and that operational costs are a transfer of resources as well as the associated taxes.

assessment also indicated that there is a social cost for the state in implementing and managing the operation due to the administrative costs inevitably involved, which affect the positive social returns assessed. This rationale reinforced the state's self-positioning as an ‘enabler’ by not considering a demand-side subsidy, especially in the most remote and disadvantaged areas.

6.2.2.4 The formulas assessed: public and private sector involvement

Based on the assumption that the public sector lacks the capacity and knowledge to operate a BSS, the regional study discussed three types of public and private sector involvement to implement the system and guide the public tendering (Chapter 7). These potential types of contracts were assessed according to the assumptions discussed above: location, size, and operational characteristics proposed as well as revenue/cost structure.

For the first type of contract assessed, called ‘DBOMF’, it meant that the operator is in charge of ‘Design, Build, Operate, Maintenance and Finance’ of the system, and the conditions offered the maximum freedom to operate and to finance the operation. In the second type of contract, called the ‘DBOM’ where the operator is in charge of ‘Design, Build, Operate, and Maintenance’, the aim was to guarantee the operator revenues and the best conditions to operate. Regarding the third type of contract assessed, called ‘DB’, the private sector was only involved in the design and build process, and the public sector would have complete control of the project [9]. Hence, only the ‘DBMOF’ and ‘DBOM’ contracts were examined in the regional study. Net Present Value (NPV) and Internal Rate of Return (IRR) were used as conventional metrics for evaluating the cost structure and the profitability of potential (private) investments, as shown in Table 6.6. The crucial assumptions in both alternatives are the different levels of private and public sector involvement. In this regard, assessing the operator in Designing, Building, Operating, Maintaining and Financing the BSS, as well as the required conditions given by the public sector. For both types of contracts, the assessment combined the four types of revenue streams and cost structure (described above) and argued to visualise the best conditions for a business opportunity. The first scenario included the public subsidy supporting the initial

9 The ‘DB’ contract was excluded from the technical/economic assessment, arguing that this model was unfeasible due to the operating model, which assumes a public institution overseeing the operation of the system, argued that the state lacks the knowledge to do so.

investment described above. The second one involved assessing a scenario of payment/exemption for the operator to pay for public space exploitation. The third scenario assessed a mixed operational system (manual and both automatic, including the extra membership for parking in some areas) and a fourth scenario, a mixed scenario combining all those mentioned conditions, as shown in Table 6.6.

For the 'DBOMF Contract', the assessment focused on a fully private system, assuming that the cost of the system operation, as well as the initial investment costs, would be assumed by the private sector. In illustrating the best profitability for an attractive business opportunity, the assessment contrasted the payment /exemption of the fee for the exploitation of a national good for public use (NGP) and a public subsidy to the initial investment when assessing the alternatives. This assessment also included the additional service of the previously mentioned extra membership structure based on a valet parking service for private bikes in less advantaged areas as well as the mixed-manual (staff-assisted docking stations) and automatic - system model. By including all those conditions, the Internal Rate of Return (IRR) rose to 30%, while by not considering any of them, it dropped to -9,7%, as shown in Table 6.6. The model called the 'DBOM Contract' focused on the operator in the role of designing, building, operating and maintaining the operational business, based on the assumption that the public sector ensures the revenues and profits as well as setting the prices. The assessed model and details regarding cost structure, revenue streams and profitability are shown in the cash flow in Appendix C.

The assessment concluded that a model involving a public subsidy and no NGP tax was the ideal scenario for implementing the BSS. It meant that the operator would obtain the ideal financial compensation conditions, covering their operational cost, recovering the investment, as well as receiving the minimum return required on the investment. Thus, the 'DBOMF' Mixed System, considering subsidising the initial investment and no NGP tax was the best alternative assessed over a period of 10 years, as in the sum made in Table 6.6 and detailed in Appendix C. This recommendation was based on the profitability of a 'regulated model company' (Santiago Metropolitan Regional Government, 2012:11). This type of assumption implies an analysis based on a hypothetical/ideal scenario of prices, applying efficiency principles for the best cost/revenue structure (Butelmann and Drexler, 2003).

The rationale for the recommendations made was twofold: while an attractive business strategy for branding and advertising purposes is created, the focus is placed on the cost and revenue streams as an average but not on the travel needs of different groups of people in the *comunas* beneficiaries, therefore, people are not 'treated as equals' under this rationale. This is shown, for example, when the IRR is based on the extra service in less attractive areas in order to 'balance' an advertising model on the basis of a degree of exposure to technologies and some groups of people to 'ensure' the 'success' of the system. In this respect, the public assessment did not focus on subsidising remote areas but on offering attractive conditions for the operation, which means perpetuating urban inequalities through an institutional bias in the design.

Table 6.6: NPV / IRR assessment by models in US$. NPV: Net Present Value. (IRR) Internal Rate of Return. NGP: national good for public use. Numbers in red colour represent negative values. Source: Adapted from Santiago Metropolitan Regional Government (2012).

MODEL	**NPV (US$)**	**IRR**
DBOMF Mixed - Manual System + subsidy + no NGP tax	1.154.143	30%
DBOM no NGP tax	564.547	21%
DBOMF no NGP tax	(1.053.950)	9%
DBOM + NGP tax	(1.547.206)	1,3%
DBOMF + NGP tax	(3.165.703)	-4%
DBOMF Mixed - Manual System + NGP tax	(6.635.838)	-9,7%
	Capital Cost	**15.41%**

Likewise, estimating costs via a 'regulated model company' profitability introduces strong biases since it is difficult to determine prices, in particular regarding the revenue streams and cost structure as well as the operation without robust state involvement. Also, planning through a free public space concession contract to improve profitability is a proposition based on depriving a municipality of the right to be involved at the operational level and ultimately affects the provision of a valid transport option to users.

6.3 Mixed governance to deploy the first *inter-comunal* BSS in Santiago: Creating a regional private and public institution

In providing the ideal conditions for implementing an inter-*comunal* BSS described above, the regional study pointed out that an institution was required to coordinate different local governments. Two primary functions for this institution were mentioned: i) to directly manage a public subsidy for financing the initial investment (bicycle, dock stations and equipment), ii) to have a strong capacity to coordinate the free-concession contracts between different *comunas* and the private operator, including the regional subsidy (Santiago Metropolitan Regional Government, 2012:257). Thus, a proposal aimed at bringing together the contracts with the selected municipalities was launched to be approved by the regional council.

Despite this advice for an integrated authority to co-ordinate the various decisions required, similar to other urban authorities worldwide (Rode et al., 2017), no such integrated authority with co-ordinating powers was established. This was because the Santiago Metropolitan Regional proposal to create a public-private partnership in charge of the BSS was rejected by the regional council in December 2013 (Agreement Report 11/12/2013 - Ordinary session Number 23, Santiago Metropolitan Government Region). As a result, the BSS was set up independently in each *comuna* by carrying out separate public procurement tenders as a bottom-up negotiation between the local government and the service operator. No records of the regional subsidy created in 2015 exist at earlier stages of the BSS deployment. Indeed, I was in charge of creating the regional subsidy to finance the BSS operation (Budget Law 2015, Minister of Finances. Chile) in 2015. However, this was not applied, as demonstrated in the interviews conducted in Chapter 7.

6.4 The two-tendering types to deploy the first *inter-comunal* BSS deployment in Santiago

The second part of this chapter analyses the public tender and the BSS scheme that took place, namely BikeSantiago. This analysis considers a description at the *comuna* level, date of tender, projections basis, and general aspects regarding the technical offer, based on the public information available in Mercado Publico platform, including public records from the municipality of Lo Barnechea[10].

In the absence of a single coordinating unit and the semi-autonomous character of the *comunal* administration in Chile, the BSS was tendered at the *comuna* level between 2013 and 2014 (Table 6.7) with a total of 14 *comunas.* The implemented system took shape as automatised dock-stations, and it was deployed through a sponsorship-based model, which comprised a transnational level -a foreign financial sponsor in alliance with a private local operator. Indeed, public information shows that a bid for the BSS BikeSantiago was offered in the tender process by only one operator, B-Cycle LATAM SpA, between June 2013 and June 2014. This period considered two types of tendering processes to deploy the BSS in the 14 *comunas* data summarised in Table 6.7.

The first tendering approach consisted of a BSS implementation by three wealthy *comunas* (Vitacura, Lo Barnechea, Ñuñoa). These *comunas* tendered and negotiated contracts with the BSS operator individually, introducing the BikeSantiago BSS within their territorial area first between June and December 2013, at the same time when the regional council was discussing a broad regional public-private partnership – without success (sub-section 6.3). The second approach was a process of implementation by 11 different *comunas* in 2014 with the same operator, entailing a collaborative tendering process supported by the two busiest ones (Santiago and Providencia), alongside some lower-income ones (for example, San Joaquin, Lo Prado). In contrast with the first tendering approach, the remaining 11 *comunas* signed a collaborative agreement to deploy the system. Thus, a collaborative initiative took place to include less advantaged areas with lower SPI, such as San Joaquin and Lo Prado. Regardless of the different approaches to tendering, each comuna had its respective BSS contract with the operator B-Cycle LATAM SpA, including specific

10 *Mercado Publico* is a public electronic platform where public institutions in Chile carry out their acquisition processes and suppliers offer their products and services, managed by the ChileCompra Direction, Ministry of Finance, Chile. All tenders were downloaded from this public platform, with the exception of Lo Barnechea where the information was taken from the municipality's website.

characteristics of the BSS provision such as usage projections with direct implications for infrastructure (e.g. docking stations), number of bicycles, and locations.

To illustrate the difference between the two types of tendering process, the Social Priority Index (SPI) is displayed in Table 6.7. Vitacura is highlighted as the wealthiest BSS *comuna* in Santiago, ranked in position 52 (Ministry of Social Development, 2017), while Lo Prado *comuna* is in position 17 by the SPI. These data revealed that a total of 223 stations and 2980 bicycles were tendered for the 14 participant *comunas* in Santiago, among the main features, as shown in Table 6.7. Interestingly is the BSS case in Las Condes *comuna,* ranked in position 51, one of the wealthiest *comunas* in Santiago. This municipality launched their local BSS in 2014 with 1,000 bicycles and ten stations (Mercado Publico, 2020). However, this system is incompatible with the inter-*comunal* BSS BikeSantiago. In this regard, this is a common issue worldwide in the bike-sharing industry, and how to ensure further integration remains unclear in this new mobility landscape.

When comparing both tendering approaches to deploy the BikeSantiago scheme, similarities and differences can be perceived. Table 6.7 shows the different tenders made and their main characteristics. One of the major similarities perceived was that all tendering processes carried out opted for only one service provider. Vitacura deployment was used as a blueprint to define key operational elements such as service characteristics and requirements. Regarding the contents and key features, differences are detailed in Table 6.7 by *comuna* level as follows: i) tender number (4), ii) *comunas* participating, iii) Social Priority Index per *comuna,* iv) publishing date of tender per *comuna,* v) contribution to system exploitation, vi) by whom the projection basis was made, vii) technical offer (docking stations and bicycle projection). Another similarity was the key performance indicators (KPIs) in both tendering types. Building upon data of the Vitacura public tender, these indicators were later integrated into the next contracts to standardise the provision of the unified system, as the information in Mercado Publico (2020) shows. The following items were identified which were to be met by the service operator: Travel information availability, Customer service communication, e-payment system, BSS travellers' cost, i.e. price for travellers, System geographic coverage, Docking station availability, Docking station maintenance, Bikesantiago bicycle availability and Bikesantiago bicycle maintenance.

Table 6.7 BikeSantiago public tendering 2013 – 2014 and System Performance 2015, including BiciLasCondes. Source: Author's own elaboration based on: www.mercadopublico.cl, www.lascondes.cl, www.lobarnechea.cl, and BikeSantiago Database 2015. *The monthly tax unit (MTU) is used as a tax measure for public space exploitation and constitutes municipal revenue. Internal Revenue Service, Chile. 1 MTU=US$66 (July 2014). NIA: No information Available / OBO: Offered by the Operator / (*) Location Map Included / SBRG: Technical offer and projection basis is suggested by the Regional Government, in accordance with the regional business model / GBM: Given by the municipality

***Inter-comunal* BSS deployment - Sponsorship-based model. Public Tendering 2013-2014**							
Tender N	**Tender Date**	**Tax for public space exploitation (MTU)***	**Projection basis**	***Comuna***	**SPI position (2017)**	**Technical Offer**	
						Stations	**Bicycles**
1	Jun-13	NIA	NIA	Lo Barnechea	50º	15	150
2	Jul-13	0,5 MTU (Semester)	GBO*	Vitacura	52º	53	530
3	Dec-13	0,12 MTU (Monthly)	GBO	Ñuñoa	47º	15	200
4	Jun-14	No Fee	SBRG	Santiago	41º	40	600
				Providencia	48º	40	600
				Maipu	44º	10	150
				Recoleta	18º	10	150
				Independencia	14º	6	90
				Estacion Central	30º	6	90
				San Miguel	46º	6	90
				San Joaquin	31º	6	90
				Macul	42º	6	90
				La Florida	45º	6	90
				Lo Prado	17º	4	60
Total Station & Bicycles Tendered - first *Inter-comunal* BSS.						**223**	**2,980**

***Comunal* deployment / Public Advertising Contract LasCondes**							
5	Jun-14	Advertising Contract	GBM	Las Condes	51º	10	1,000

The most striking difference is the types of tenders made related to the isolated or collective character, as described above. Connectedly, some features were tendered and offered differently. For example, while the technical offer for Vitacura and Ñuñoa relates to stations, the number of bicycles and their location was an offer made by the operator. Indeed, the technical offer was mentioned for the collective tendering as 'previous operator experience'. Therefore, the basis of the projections was a suggestion made in the public tender documents to be offered by one company, in accordance with the projections made in the regional business model.

Also, connectedly with this marked difference, another key discrepancy between the two approaches was that the first tendering imposed a public goods exploitation tax, while the second one excluded such a tax, in accordance with what was previously assessed in the business model. This difference is also perceived in the tendering objectives. Thus, while for the first approach, the system is tendered as a service concession 'in addition' to the public space for advertising purposes, which involves a tax, for the second approach, the system is defined as a contribution from companies as social responsibility, which excluded such tax in this regard.

> … the purpose of selecting a natural or legal person to whom the Municipality of Vitacura will award the concession for the provision, installation, maintenance, and operation of a bicycle service aimed at users of Vitacura *comuna,* and in addition to the advertising spaces associated with the BSS, all under the conditions detailed in these Administrative Rules and the Technical Rules. (Vitacura *comuna* tendering, Mercado Publico, 2019:2)

> This service is conceived in the form of an exclusive concession that makes possible the provision, installation, maintenance and administration of an inter-*comunal* BSS in a self-service model, financed by the users and contributions from companies, within the framework of their policies of social responsibility. For the same reason, it is not a service financed by advertising (Collaborative tendering, Mercado Publico, 2019:2)

The basis for these projections was mixed in nature when comparing the tendering process with the regional study. For the first three *comunas,* Lo Barnechea, Vitacura, and Ñuñoa, as they tendered first individually with the private operator, these local areas established their own projections based on their local needs, in agreement with the service operator. However, these projections did not necessarily consider regional needs. The unified projection of bicycles and docking stations of the remaining 11 *comunas* are coincidental with the regional business model, as I was in charge of promoting BikeSantiago as a collaborative process in my position at the Regional Government due to some municipalities indeed had more capabilities to empower such decisions than others.

Chapter 7. The implementation process of the BSS BikeSantiago: an inter-governmental agreement

This chapter aims to provide linkages between institutional and operational levels to deploy the BSS in Santiago, highlighting the role of inter-governmental agreements in fostering or hindering the reproduction of inequalities. In particular, this chapter explains how, in practice, territorial disparities are created as a result of self-organised municipal practices, which, at the same time, are challenged by an inter-governmental agreement in an attempt to introduce inclusive practices in decision-making to deploy the BSS BikeSantiago in 14 *comunas.* Thus, this chapter analyses the relevance of the inter-governmental agreement and flexible contracts in defining a transition pathway in Santiago.

The inter-governmental agreement and self-organised practices comprised in the BSS deployment are analysed through the understanding of both socio-spatial inequalities leading to segregation and collaboration (Chapter 4). This chapter is divided into four qualitative categories of analysis derived from the paradox in the corporate sustainability framework (see Chapter 4): 1) a Private Social Investment (PSI) as the scheme case, 2) emerging patterns (collaboration and segregation), 3) aligned benefits, and 4) experienced tensions (Smith, 2014; Stadtler and Wassenhove, 2016; Stadtler, 2018). By analysing how decision-makers dealt with simultaneous institutional synergies and tensions, these categories helped to capture the enabling environment created to deploy the BSS, giving rise to significant insights into the character of the resulting transition pathway in Santiago. Two data sources are used: i) secondary data derived from the public tendering for the first Inter-*comunal* Bicycle Sharing System in Santiago (Mercado Publico, 2020) (Table 7.1) and Itaú Unibanco Holding S.A, Annual report (2017) and ii) interviews with key actors related to the implementation process (Table 7.2). With these sources, different roles, positions and perspectives regarding decision-making practices are highlighted. Relevant quotes regarding the implementation process are displayed in Appendix B1. Table 7.1 summarises the present data structure and coding scheme regarding the public tendering approach.

As a quick reminder from the previous chapter, the first inter-*comuna* BSS deployment in Santiago BSS tendering and scheme implementation is first provided to contextualise this chapter (Table 7.1 and 7.3). The BikeSantiago implementation started in 2013 with Vitacura *comuna* and concluded at the beginning of 2016 through

the BSS deployment in the Lo Prado *comuna.* This public tendering can be divided into two separate approaches. The first approach was implemented by three wealthy comunas (Vitacura, Lo Barnechea, Ñuñoa), which negotiated contracts with the BSS operator individually and introduced early the BikeSantiago BSS within their territorial area. The second approach was implemented by the remaining 11 *comunas* in 2014 with the same operator, entailing a collaborative process supported by the two busiest ones (Santiago and Providencia), alongside some lower-income ones (e.g. San Joaquin, Lo Prado). From this tendering process in Santiago Metropolitan Region, the BSS totalled 223 docking stations and 2,980 bicycles across 14 *comunas.* Projections were estimated locally for each individual approach for the three wealthy *comunas,* and regionally for the 11 remaining ones according to the regional study (Table 7.1). In addition, the first approach was used as a blueprint to define key operational elements such as service characteristics and requirements for the second one.

Table 7.2 shows the expert and key stakeholders interviewed. They were selected regarding their particular role and perspective about the processes of the BSS deployment. In particular, the expert interviews sought to provide an understanding of key aspects regarding the processes of the BSS deployment, from an 'insider' viewpoint: i) the design and implementation of the BSS provision, ii) the relationships and agreements made by the different actors to deploy the system, iii) the effects of the decision-making, and iv) the social and urban contribution and the final beneficiary population. The interview also started by clarifying the role of each actor in the BSS deployment. Participants described multiple aspects of the process of deployment (both positive and negatives), the relationships with other actors and institutions (including the service provider and the financial sponsor). It is important to highlight that by 2017 the service provider faced a process of a legal court case due to its operational processes. Despite the fact that this institutional issue was not anticipated by this research, the operational levels constituted a knowledge interest to further understand relationships between institutions and organisations at the sub-national level when deploying the BSS BikeSantiago as a niche-innovation.

Table 7.1 Decision-making to deploy the first *inter-comunal* BSS. Sources:

1. Santiago Metropolitan Regional Government (2012). *Feasibility Study and Management of Public Bicycle Concession for Greater Santiago*. Development and Planning Division. Santiago de Chile.www. https://www.gobiernosantiago.cl/
2. Agreement Report 11/12/2013 - Ordinary session Number 23, Santiago Metropolitan Government Region
3. Itaú Unibanco Holding S.A, Annual report 2017:85
4. Public Tendering 1. BSS Lo Barnechea published in June 2013 '*Concession of the Service, installation of stations and rental of bicycles in Lo Barnechea comuna'* to the company B-Cycle LATAM, SpA. (Source: Municipal Decree N 4518, www.lobarnechea.cl), adjudicated in August 2013.
5. Public Tendering 2. BSS Vitacura: published in July 2013 '*Concession for the provision, installation, maintenance, and administration of a public bicycle system for Vitacura comuna'* to the company B-Cycle LATAM, SpA. Source: www.mercadopublico.cl, municipal decree N 2729, adjudicated in September 2013.
6. Public Tendering 3. BSS Ñuñoa published in December 2013 '*Concession for the provision, installation, maintenance, and administration of a public bicycle system for Ñuñoa comuna'* to the company B-Cycle LATAM, SpA. Source www.mercadopublico.cl, municipal decree N 172, adjudicated in January 2014.
7. Public Tendering 4. *Inter-comunal* BSS Tendering Process: published in June 2014 *'Concession for the provision, installation, maintenance, and administration of an inter-comuna public bicycle system for various comunas of Santiago city'* to the company B-Cycle LATAM, SpA. Source: www.mercadopublico.cl, municipal decree N 3591, adjudicated in October 2014.

<table>
<tr><th colspan="7">Decision-making timeline implementing the first inter-comunal BSS in Santiago</th></tr>
<tr><td>Institutional Levels / Year</td><td>2012</td><td colspan="3">2013</td><td>2014</td><td>2016</td><td>2017</td></tr>
<tr><td>Regional Government</td><td>1. 'Feasibility and Management of a Public Bicycle Concession' (the regional business model)</td><td colspan="3">2. Regional Development Corporation (creation) Discussion at the Coordination Commission, Regional Council of Santiago ➧ Regional development corporation (Rejection)</td><td rowspan="2">7. Public Tendering 4: Collaborative Tendering (to implement BikeSantiago in 11 comunas)</td><td rowspan="2">End of the implementation process (14 comunas)</td><td rowspan="2">Fieldwork (first year of full operation)</td></tr>
<tr><td>Local Government (public tendering)</td><td></td><td>4. Public Tendering 1: BikeSantiago Lo Barnechea</td><td>5. Public Tendering 2: BikeSantiago Vitacura</td><td>6. Public Tendering 3: BikeSantiago Ñuñoa</td></tr>
<tr><td>Private Sector</td><td colspan="6">3. PSI scheme (Itaú Unibanco Holding S.A – B-Cycle LATAM SpA)</td></tr>
</table>

Figure 7.1 summarises the present data structure and coding scheme, adapted from the paradox in the corporate sustainability framework (see Chapter 4). As explained in Chapter 2, this data analysis considers an inductive and deductive process in accordance with the pragmatic epistemology adopted, which allows a pluralistic position to integrate different approaches to the study subject (See Chapter 2).

Accordingly, an interlinked data structure and coding scheme were developed. Supported by the interview guidelines, an inductive process was conducted first to explore the range of content that interviewees made of the decision-making process to deploy the BSS BikeSantiago, organising topics by differences and similarities.

After this inductive process, the paradox framework helped organise the different contents as a deductive approach (Hennink et al., 2011). The decision of this analytical framework was made based on the nature of the data obtained from the inductive process. This framework was also chosen in light of the institutional characteristics of the context, the challenges faced by the inter-governmental agreement made to include more and heterogenic *comunas,* and the nature of the sources to deploy the BSS in Santiago.

In this regard, while the contents analysed inductively showed conclusive aspects of the decision-making process to deploy the BSS BikeSantiago, the type of argument also expressed contradictory and synergistic processes at the same time. Phrases such as ‘I see it was a successful project even though it has many problems’ or ‘it was a good agreement but a weak one’ gave rise to issues in collaboration when challenging patterns of segregation. To adequately address this type of data, data coding schemes founded in the literature were defined in Chapter 4 to better understand the collaborative issues in decision-making under a particular institutional setting. Thus, by adapting the codes schemes from the literature, four categories comprised an aggregated level for the data structure, followed by the second order-dimensions to contextualise them, recognising recurrent patterns when interviewees referred to the study subject. To move towards the analysis and interpretation, I turned to first-order codes after several iterations to avoid overlapping, analysing key specific contents that appeared on the topics raised (Figure 7.1). In addition, I decided to transcribe and manage the information on my own to preserve data protection when analysing the data.

This chapter is divided into four qualitative categories comprised at the aggregation level to organise the analysis and interpretation: 1) a Private Social Investment (PSI)

as the scheme case, 2) the emerging patterns (collaborative and segregation), 3) aligned benefits, and 4) experienced tensions (adapted from Smith, 2014; Stadtler and Wassenhove, 2016; and Stadtler, 2018).

In addition, relevant quotes regarding the implementation process are displayed in this analysis, based on Appendix B1.

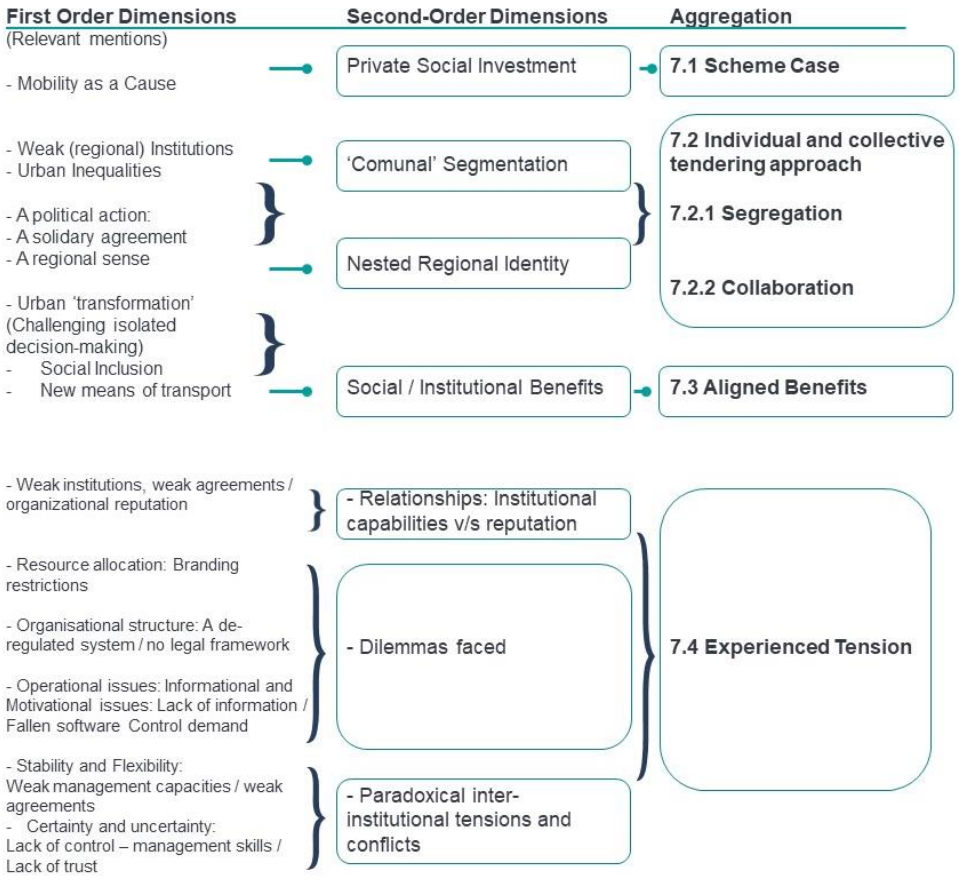

Figure 7.1. Data Structure. Coding Scheme. Source: Author's own elaboration based on Smith (2014:1602), Stadtler and Wassenhove (2016:669) and Stadtler (2018:335).

Table 7.2: Interviews conducted in Santiago Metropolitan area. Source: own elaboration based on the fieldwork design

	N	Role	Identifier	Date of Interview
National Level	1	Head of Legal Division - National Consumer Service	N1	10/10/2017
Regional Level	2	Regional Executive of Santiago	RG1	21/08/2017
	3	Regional Coordinator (Implementation / Operation process)	RG2	27/06/2017
	4	(Former) Regional Coordinator (Planning Process)	RG3	19/06/2017
	5	Regional Councillor 1 (Planning process)	RG4	08/08/2017
	6	Regional Councillor 2 (Planning process)	RG5	01/12/2017
Local Level	7	Leader and practitioner, Municipality of Santiago (Inner City, medium - income level)	LG1	16/08/2017
	8	Leader and practitioner, Municipality of Santiago (Inner City, medium - income level)	LG2	29/06/2017
	9	Leader and practitioner, Municipality of Providencia (East Area, high - income level)	LG3	21/08/2017
	10	Practitioner, Municipality of Recoleta (North area, medium / low - income level)	LG4	25/08/2017
	11	Practitioner, Municipality of La Florida (South-east area, medium / low - income level)	LG5	20/11/2017
	12	Practitioner, Municipality of Independencia (North area, medium / low - income level)	LG6	10/05/2018
	13	Practitioner, Municipality of Maipu (West area, medium / low - income level)	LG7	07/05/2018
Private Sector	14	BSS Sponsor - Manager of Corporate Affairs and Sustainability (foreign financial sponsor)	PS1	08/09/2017
	15	BSS Coordinator (Marketing Manager)	PS2	09/03/2017
	16	BSS Finance Manager	PS3	15/03/2017
	17	BSS Operations Manager	PS4	25/04/2017
	18	BSS Fleet Operator	PS5	14/09/2017 - 02/1272017
	19	BSS Fleet Coordinator (UTB)	PS6	24/11/2017
Experts	20	Academic Researcher in Transport 1	E1	16/11/2017
	21	Academic Researcher in Transport 2	E2	18/12/2017
	22	Academic Researcher Urban Planning	E3	18/12/2017
	23	Expert in Intellectual Property Lawyer	E4	28/12/2017
	24	Expert in Public Concessions in transport	E5	19/12/2017
	25	Expert in Business Models	E6	07/07/2017

7.1 Deploying a BSS as a 'social cause'

Different solutions for business models in bike-sharing have been widely discussed in the literature (see Chapter 4 and 6). In many cases, these schemes are often implemented supporting the formal public transport system or are deployed for leisure purposes, all of which vary their revenue streams and cost structure formulae.

Interestingly, a less explored model is related to a hybrid organisational type pursuing sustainable and social goals in mobility embedded in a voluntary organisational arrangement (further explained in Chapter 4). Indeed, a Private Social Investment is the scheme examined that gave rise to the BSS in Santiago. Focusing on how this 'hybrid' business strategy is positioned in the public sphere providing goods/services of 'public interest' with philanthropic motivations, the decision-making process to create an enabling environment is analysed in this chapter.

As in Chapter 4, PSI is understood as a voluntary resource allocation aiming at transforming conventional philanthropy, to a more 'creative' donor action participation in projects of 'public interest' (Andion et al., 2012). Nogueira and Schommer (2009) defined Private Social Investment (PSI) as a 'movement' led by a Brazilian -business-association investing in social, cultural and environmental projects. As a member of the philanthropic group GIFE, Itaú Unibanco Holding S.A. (from now on, the financial sponsor of the BSS), decided to support a Bicycle sharing Scheme as a 'cause' in urban mobility. Thus, the inter-*comunal* BSS in Santiago took shape as a mobility 'cause' through a Private Social Investment scheme (PSI), to provide an "access to safe, affordable, and sustainable transport system", as the company declared in their annual report below. Hence, a 'philanthropic' institutional behaviour supported by a large investment company is motivated by specific urban mobility objectives, the BSS BikeSantiago is deployed here as a 'social cause' as in the quotation:

> … We recognise the importance of valuing active transport for the sustainable development of cities, we define urban mobility as a pillar of investment within our platform of sustainability…seeking to influence public policies that promote the use of bicycles in people's day-to-day life. The cause dialogues with the Sustainable Development Goals, encouraging access to systems of safe, affordable and sustainable transport…. we started sponsors Bike Rio in partnership with the City Hall of Rio de Janeiro. The success of this program led to the expansion of the project to São Paulo and Porto Alegre in 2012, Pernambuco, Salvador and Santiago (Chile) in 2013, arriving in Brasília and Belo Horizonte in 2014… In 2017, we started the renovation of the project in Pernambuco, Porto Alegre, São Paulo and Rio de Janeiro. We imported cutting-edge technology still foreign to Brazil and reviewed the standards of operation and implementation (Itaú Unibanco Holding S.A, Annual report 2017:85).

One of the most striking differences is made between the concept of Corporate Social Responsibility (CRS) and Private Social Investment (PSI), according to the Manager of Corporate Affairs and Sustainability, a representative of the ITAU bank in charge of the system. They find very relevant the proximity to the people and the company's relationship with its environment are one of the key values for this investment decision, alongside the explicit reputation of carrying the brand on a bicycle.

> We are not talking about Corporate Social Responsibility, but about sustainability... it means bringing value to the city, to society, and helping with mobility, reducing congestion with faster, friendlier mobility option... a company and its environment... its relationship with society must have an additional contribution to the business.
>
> In our advertisements, we try to reflect closeness, children, soccer, family, not only Itaú sponsors ...BikeSantiago communicates emotions, closeness...people identify the bank with the bicycles... the orange ones are the bicycles of Itaú that are super installed; therefore, it gives you a strong and positive brand presence in the streets, everywhere, and ideally more and more...' (PS1, September 8, 2017).

PSI schemes differ from CRS as the former is an expression of a 'participative and responsible citizenship' when looking at the sponsor side (Brito and Melo, 2007). GIFE group, an association of Brazilian social investors constituted as a non-profit organization in 1995, becoming one of the major references in Latin-America in the field of private social investment (Andion et al., 2018), has distinguished the PSI practice from solely marketing purposes by adding attributes of the urban and social experiences, as in the quote:

> Practices in Social Investment have a distinct nature and cannot be confused as a tool to commercialise tangible or intangible goods with the purpose of marketing profit for companies like, for example, marketing (GIFE, 2012:01)

This difference may appear a little confusing at first glance, but it derives from a PSI practice seeking 'autonomy' from the core business to enhance the business's public interest with social actions (Andion et al.,2012). However, this does not detract from the fact that there is an explicitness effort that can undeniably lead to marketing actions.

Looking at how a PSI is organisationally structured, private actors engaged as part of the BSS process were mentioned as follows: ITAU as a financial sponsor and creditor, B-Cycle LATAM SpA as a service provider, and B-Cycle LLc as a manufacturer in charge of providing software and the trademark. The PSI financing scheme involved a private contractual scheme between the sponsor and the service provider: a lease contract to finance the initial investment (i.e. infrastructure, vehicles, and equipment), and a branding contract to finance the system operation, as shown in the quotes in Table B-1 (Appendix B). The financial institution assumed a position as the lender-owners of the system, financing the initial investment and the operation. Both ITAU and B-Cycle LATAM SpA were related in creating the BikeSantiago trademark by 2012.

Through this flexible financial formula, a bicycle is considered as an urban 'asset' where 'active' mobility is associated with an urban experience led by the brand. In this regard, the BSS is described as: i) "a commitment of the financial institution with its environment", ii) "a link between the society", iii) a mechanism "to reflect closeness", and iv) an alternative in "reducing congestion... with faster, friendlier mobility" (PS1, September 8, 2017), as shown in the quotes in Table B-1 (see Appendix B). This alliance between ITAU and B-Cycle LATAM SpA enabled the service provider to proceed in implementing the system, selecting first the three wealthiest municipalities in Santiago in 2013.

7.2 Individual and collaborative institutional practices to deploy the BSS BikeSantiago

While a regional institution being put in charge of the system was being debated unsuccessfully in the regional council, simultaneously, the BSS began its implementation based on an individual tendering type, as shown in Chapter 6. This was a process carried out between the service operator and three wealthy municipalities separately during 2013. This isolated action meant a stratification marker or a *comunal* segmentation, with a socio-economic class that connotes the territory (Otero-Bahamon, 2019). In response to this isolated pattern, the second approach in tendering entailed a collaborative process supported by the two busiest *comunas* in Santiago Metropolitan Region (Santiago and Providencia).

A collaborative action in decision-making meant a synergistic cluster of *comunas* to effectively integrate disparate and heterogenic areas into the deployment process to achieve a unified system. Both approaches are analysed as institutional-organisational practices in urban mobility.

7.1.1 The individual tendering types

As discussed in Chapter 3, an increasing amount of the literature about bike-sharing systems has emphasised their social benefits, arguing they are non-inclusive systems which often involved gentrification processes (Sheller, 2015). Consistently, the different actors and experts involved in the BSS BikeSantiago's deployment pointed out a tendency, at the *comuna* level, to take isolated decisions among the better-resourced *comunas,* as in the first tendering approach. They referred to weak institutions in conjunction with the reproduction of inequalities.

> There was a process of inorganic expansion in which each *comuna* was making its own system, in the absence of a robust metropolitan and/or regional structure (RG1, August 21, 2017).

> [This is] 'a logic that does not promote *inter-comunalidad*... a logic of urban plots' (LG3, August 21, 2017).

Urban inequalities in Chile are explained as a relationship between the high-income group location and the presence of public infrastructure and services: "the available infrastructure tends to be used as a means of attracting high-income groups..." and "urban infrastructure tends to be captured by (them)" (E3, December 18, 2017). Where these socio-economic groups are concentrated, the infrastructure and mixed land uses are located. Hence, the first tendering approach followed these territorial market-led principles. Concepts such as 'classist', expressed the system's perception among interviewees:

> The journey is not generally analysed as a concept, which is very important. That is why the city is fragmented, and the mobility of people is not linked… in the daily mobility the inequality that we live in, then the public services, which are poorly planned, affect some groups of people… Supposedly, the infrastructure was made to connect, bridge, not bring together but divide… This infrastructure of the bank I don't know what connects… It can increase the flow of bicycles; however, it does not relate to a larger (regional) context.. (E2, December 18, 2017).

Furthermore, the usefulness of the system was questioned among experts when comparing their size and position in relation to urban scale and needs, highlighting the disconnection with the real social needs of the majority. Concepts such as 'division' and an 'urban fragmentation' describe the idea of a reinforcement of socio-spatial inequalities brought about by the new system. Urban inequalities also relate to the dominant rationale of travel choice in transport planning, based on the people's decisions, but assumed from a 'social vacuum' where the focus on users and their trajectory experiences are disregarded. This lack of social awareness is linked to a lack of planning:

> … Due to a lack of planning in the city... the system has been very elitist ... even in *comunas* like Independencia or Recoleta ... coverage in those places is practically non-existent. This elitism responds to the financing structure that it has, finally it is a private business... it does not respond to a logic... locating them where they are needed.... you can see that it is a private project using public goods, apparently it is subsidised. Still, it is not clear... they do not have an integrated fare, they are not integrated into the transport system... and I do not know if they are coordinated... in general, having to go and talk to one or another is an indicator of how weak our governance is. As a consequence, this problem is not an integrated system, that the coverage is biased by the level of income, without adequate cycling infrastructure (E1, November 16, 2017).

In a broader sense, 'mobility as a public good' expressed the sense of the 'public' in 'transport' manifested as an urban right or a guarantee for the inhabitants.

> …one of the big problems is that there are no guaranteed urban rights' and 'mobility should be considered as a public good' (E3, December 18, 2017).

7.2.2 The collaborative tendering processes

The individual and collaborative practices are interlinked approaches to the two types of tendering process to deploy the BSS BikeSantiago, as shown in Table 7.3. As a challenging response to the first 'unequal' approach in the three wealthiest *comunas* in Santiago, a collaborative local government action emerged by re-grouping the sub-national level synergistically to unify 11 *comunas* with a single new mobility deployment, as described in Chapter 6. Encouraged by the regional government of Santiago, a novel and collaborative public tendering effectively brought together 11 *comunas* in Santiago in a tendering process, expecting to provide an *inter-comunal* system to 14 heterogeneous and the busiest *comunas.*

7.2.2.1 A 'political' action promoting a sub-national alliance

The horizontal and flexible collaborative sub-national partnership between local governments was seen by interviewees as 'an alliance', 'encouragement for a solidarity agreement', 'a participative model'; yet, one which allowed 'an effective' cooperation between the *comunas* (Table B1-3, Appendix B). This collaborative action was also an expression of a political strategy at the regional level appealing to a sense of regional identity, advocating a sense of commonality to trigger the deployment. It is relevant to highlight the relationship between the sub-national and trans-national levels, as the collaborative action was already established and evaluated in the regional business model (Chapter 6). At this stage of the decision-making, different roles were assumed. For example, at the regional level, the regional executive, in turn, described his participation as an implementation 'convener'. At the local level, two types of actors were identified: those municipalities that led the BSS implementation and those who were invited to jointly deploy the BSS, as shown in this quotation.

> A process of inorganic expansion [of the BSS BikeSantiago regarding the deployment on the three wealthiest *comunas*] was coming, in which each *comuna* deployed its own system, based on this endemic problem of Santiago city, that is, a territorial fragmentation of the local governments and the absence of robust metropolitan governance… I understood that one of my roles, beyond the concrete attributions or economic power -which we did not have- 'was to convoke' by using the figure of the regional executive, who is a figure that symbolically says much more than the capacities and faculties that it has, to convoke and promote a collaborative agreement. (RG1, August 21, 2017)

This dynamic of collaborative decision-making demonstrates a sub-national 'empowerment' to address the course of actions, and this sub-national cohesion serves as a point of convergence at the sub-national level, challenging the conventional conceptualisation of the regional and local level as governance 'silos' in decision-making. Thus, the emergence patterns -segregation and collaboration - to deploy the BSS engendered an external private-intervention influencing the public-sphere as an inner-pulse to deploy the system on a city scale.

> .... [my role was] to promote, based on the largest municipalities (and with more capacity to attract good bidders), a solidarity tendering process that would involve other municipalities... to convene everyone and to promote this agreement... with which it was possible for 11 municipalities to effectively bid jointly on a complex administrative mechanism, and for this tendering process to be awarded by the same company that had three other municipalities. I think it was a good agreement, fragile, but still ... I think that the image and the idea of the city were reinforced by the idea of the public bicycle system and vice versa, that is, the public bicycle system was reinforced by the idea of cooperation among municipalities (RG1, August 21, 2017).

Thus, this novel sub-national association is perceived by the key actors interviewed as a shared experience to achieve a common goal of deploying the BikeSantiago scheme in the highly 'unequal' metropolitan region of Santiago. This is also an expectation of moving away from the persistence of socio-spatial segregation.

> The Metropolitan Regional Government invited a number of municipalities to participate in a new project that would be implemented as an alternative transport system in most of the municipalities in the Metropolitan Region ... The system for us and the great majority of the *comunas* was seen as something very far from being implemented ... a relatively elitist system... (people) never thought that this system would be implemented in lower-middle-class and peripheral *comunas*... [now] people see themselves as part of the Metropolitan Region (LG5, November 20, 2017).

7.3 Aligned benefits within the inter- governmental agreement

Through this private-public partnership, the regional government sought a sub-national effort as an alternative means of addressing social and regional needs in transport, contesting the administrative rationale that promotes isolated and segregated practices. This collaborative rationale gave rise to significant urban and social challenges regarding the *comunal* constraints related to the "empowerment" capacity of weak sub-national institutions in Chile.

Indeed, the BSS deployment via a collaborative action set a precedent as an alternative solution to provide a new transport system between several municipalities across Greater Santiago under the rationale of social inclusion (see Table B1-5 in Appendix B for details). This was an attempt to include different areas of the city as shown in Chapter 6 with the Social Priority Index. As a political action (Table B-3, Appendix B), the collaboration also introduced a 'regional' sense, aligning these benefits across the 14 *comunas.*

Although this action involved a political decision to unify local efforts, it is also a ‘symbolic’ agreement regarding the nature of the public tendering carried out. A public procurement assumes governments are carrying out efficiently tendering processes with high standards to address the public interest through delivering such a novel transport service. It is also true that due to the difficulties involved in regional planning in Chile (Chapter 5), this collective action, promoted by the intendant on duty, may have been the best option to achieve a regional image with a unified system.

However, the institutional challenges in the tendering process are related to the recognition and work at the operational level on the differences between the *comunal* needs, that is by subsidising the demand, thus enabling sustaining such a philanthropic action over time rather than just creating the ‘enabling environment’ for a BSS deployment via a PSI-based system generically for all *comunas.*

Table 7.3: BikeSantiago Public Tendering 2013 – 2014 and system performance 2015, including. Source: Own elaboration based on: www.mercadopublico.cl, www.lascondes.cl, www.lobarnechea.cl, and BikeSantiago Database 2015. *The monthly tax unit (UTM) is used as a tax measure for public space exploitation and constitutes municipal revenue. Internal Revenue Service, Chile. 1 MTU=US$66 (July 2014). NIA: No information Available / OBO: Offered by the Operator / (*) Location Map Included / SBRG: Suggested by the Regional Government / GBM: Given by the municipality

***Inter-comunal* BSS deployment - Sponsorship-based model. Public tendering 2013-2014**								**System performance 2015**			
Tender N	**Tender Date**	**National good for public use tax (MTU)***	**Projection basis**	***Comuna***	**SPI (2017)**	**Technical Offer**		**Stations**	**Docks in operation**	**Additional Bikes (am)**	**Additional Bikes (pm)**
						Stations	**Bicycles**				
1	Jun-13	NIA	NIA	Lo Barnechea	50º	15	150	13	141	0	0
2	Jul-13	0,5 MTU (Semester)	GBO*	Vitacura	52º	53	530	36	502	0	0
3	Dec-13	0,12 MTU (Monthly)	GBO	Ñuñoa	47º	15	200	15	261	0	260
4	Jun-14	No Fee	GBRG	Santiago	41º	40	600	28	770	350	800
				Providencia	48º	40	600	33	774	645	65
				Maipu	44º	10	150	4	80	0	0
				Recoleta	18º	10	150	5	91	0	70
				Independencia	14º	6	90	3	65	0	75
				Estacion Central	30º	6	90	2	40	0	35
				San Miguel	46º	6	90	0	0	0	0
				San Joaquin	31º	6	90	0	0	0	0
				Macul	42º	6	90	0	0	0	0
				La Florida	45º	6	90	0	0	0	0
				Lo Prado	17º	4	60	0	0	0	0
Total Station & Bicycles Tendered - first *Inter-comunal* BSS						**223**	**2,980**	**139**	**2,724**	**995**	**1,305**

7.4 Tensions experienced between the institutional arena and the operational level

Despite the collaborative approach to deploying the inter-*comunal* BSS BikeSantiago, complexities, misalignments, and disputes between the institutional and operational levels appeared emanating from the double-tendering process. There were tensions during the BSS deployment, an issue examined here according to a number of topics, derived from the corporate sustainability and paradox framework (Chapter 4 and Figure 7.1) i) relationships ii) dilemmas faced, and iii) paradoxical institutional and organisational tensions.

7.4.1 Relationships: institutional capabilities and reputation

Inter-institutional tensions arise from the two tendering types carried out. Expressions such as “a good but a weak agreement” (RG1, August 21, 2017) illustrate the nature of the decision-making in the context of weak institutions such as Chile (Chapter 5). Furthermore, within a PSI, the ‘reputation’ of an organisation gave rise to recognition and a sense of commitment from whoever was ultimately in charge of the system.

7.4.1.1 Institutional capability-related conflicts: a weak sub-national governance capacity and weak agreements

Even when the regional executive expressed a need for a robust regional governance structure, the legal body that guides regional government actions constrained the state involvement in practice. This was a related discussion when the public-private partnership in charge was rejected by the regional council (Chapter 6). The expected use of this partnership was left in doubt when it was being voted on and also from the descriptions made by the interviewees. The arguments against their creation were that this novel institution would basically be in charge of coordinating the municipalities in providing the free public space and administering the subsidy for the operation. However, they would not effectively be in control as the system was private, thus generating tensions associated with mistrust.

Furthermore, the collaborative agreement also involved municipalities "losing their ability to get involved" (RG1, August 21, 2017) from the operational levels due to the flexible agreement made in the second tendering. However, ‘weak agreements’

seemed to be the best option for inclusion. Simultaneously, this semi-autonomous character of the sub-national levels witnessed interest from the transnational level to introduce a branding strategy via a flexible and de-regulated scene.

Thus, the rationale of the second tendering process introduced significant challenges regarding the nature and scope of the contracts. The free concession of the public space was agreed to facilitate the branding of the sponsor – ITAU bank, yet the contracts were not a concession of a service. Since it was no longer possible to grant a service concession, no municipal control could be set up due to the national good for public use tax exemption as a free public space concession type of contract (Table 7.3 and Chapter 6), where municipalities lost "their ability to get involved" (RG1, August 21, 2017) to regulate the operation.

Hence, a weak governance capacity relates to weak agreements when pursuing social goals under branding purposes, in line with an 'incomplete' contract or a type of ambiguous agreement that omits crucial matters (Hart, 2017).

7.4.1.2 Reputation-related tensions

> ITAU is a sponsor and also a creditor, they (the operator) have a loan with the bank with which they did this business and regarding which (the bank) has a reputation in respect of the brand … people talk about those bicycles as the ITAU bicycles, so they have a great commitment to making this system work… (LG1, August 16, 2017).

As a result of the different public and private flexible arrangements made, the business partners ended up in dispute due to problems at the operational level and the sponsor reputation was mentioned as a crucial element in its resolution. These results are consistent with studies in paradox in corporate responsibility, as the reputation emerges from companies wanting exclusive positions and benefit attributions (Thomas and Fritz, 2006; Peloza and Falkenberg, 2009). However, the institutional and organisational challenge it is not a matter of reputation enhancement but of relational design between key partners. If only one actor is responsible for providing the BSS, it is difficult to guide the expected outcomes, in particular considering a completely unregulated scenario introduced by the free public space concession contract. To ensure institutional commitment, a dispute resolution system, as well as an integrated strategy between the actors, would lead to the pursued social goals. Similar findings are discussed by Stadtler (2018) on the

alignments and misalignments between NGOs, the government, multiple companies (here, the business partners), and civil society when analysing collaboration and competition. Stadtler (2018) also explains that transparent commitment processes require managing competitive tensions and disputes to address social goals, helping to reduce the risk of monopolistic behaviours and path-dependency (Martens, 2007).

7.4.2 Dilemmas faced

Dilemmas faced discussed by the interviewed were grouped under two themes: 1) resource allocation and 2) the organisational structure provision.

7.4.2.1 Dilemmas in resource allocation

In managing the two-tendering process, several topics arising from the interviews were related to the assets and revenue stream dilemmas in allocating resources for the BSS deployment. Therefore, those topics were grouped into two interrelated sub-groups: 1) resources allocated (by type, purposes and by whom), and 2) resource restrictions (branding and advertising).

Resources allocated

Given that for BikeSantiago the choice of a revenue structure was financed solely by the sponsor through a branding contract, the system had two sources of revenue. While the sponsor financed the larger portion of the cost structure, membership fares contributed a small part of the revenue stream. There was no other financial source of funding, and no public funds were involved in the earlier stages of the deployment. Hence, considering a conventional BSS deployment equation via a PSI scheme, while the sponsor appears as the principal financer, the state did not allocate the public subsidy created in 2015 for these purposes. Indeed, a regional subsidy was created to finance the operation[11] in 2015 to finance the system operation; however, no records for its application in the earlier stages of the deployment[12] exist yet, as some conditions from the operator, namely transparency and accountability regarding the lack of information on the operational level, were mentioned that

11 Budget Law 2015, Minister of Finances. Chile
1212 https://www.gobiernosantiago.cl/wp-content/uploads/2018/04/Cuenta-P%C3%BAblica-Intendencia-2017-2018.pdf

undermined the allocation of public resources. Neither is just providing a subsidy ensure a fair operation of an unprecedented system since this is a relational matter between the key partners involved in the deployment of the BSS BikeSantiago.

Furthermore, the negotiation was related to the free public space concession contract as a public 'asset', with a view of integrating different areas of the city and materialised via a tax exemption. Therefore, this agreement was explained by a key actor interviewed, who related the BSS BikeSantiago deployment as a public good: "A free concession of the land was agreed to promote the system as a public good, as the superior good considered" (LG1, August 16, 2017). Here 'superior good' means the public space as an asset to exchange. However, the land as an asset was not sufficient value in exchange under a conventional PSI formula, in particular without public funds involved. Moreover, this type of land concession involving a tax exemption agreed upon did not allow a service concession. Instead, there were agreements to provide the conditions for a transaction between the operator B-Cycle and the international investor, Itaú Unibanco Holding S.A.

Resource restriction

Resource restriction relates to the nature of the resources allocated. In Chile, branding and advertising contracts have extensive restrictions, such as the presence of a trademark and the proximity to other brands on the public street. Although they normally involved a potential municipal revenue, these urban entrepreneurial practices in effect lead to a socio-economic segmentation of the comunas, since through these market principles not all brands will be present in the same way through the metropolitan area.

> This 'unique' formula of the concession was so defined due to the branding restrictions that the *comunas* of Santiago and Providencia had since in these two *comunas* the exploitation contracts for advertising had already been assigned… The model based on a joint tender was finally the one that could be implemented... (LG2, June 29, 2017).

For example, suppose two branding/advertising contract schemes coexist at the metropolitan level. In that case, these two will be in dispute because of their branding restrictions derived, a local 'autonomy' in decision-making and a weak regional institution. Thus, the co-existence of different models becomes the emerging mobility landscape in Santiago. Indeed, Las Condes *comuna,* the second wealthiest *comuna*

in Santiago, deployed its *comunal* BSS -BiciLasCondes[13]- in 2015, only operating inside the *comunal* boundaries, comprising 100 docking stations and 1000 bicycles and with its own management system. Furthermore, while the inter-*comunal* system in Santiago relates to a Private Social Investment led by a multi-national institution, the local system in Las Condes responds to a conventional street advertising formula (e.g. Clear Channel). However, these two systems were incompatible with each other, both technologically and regarding their business models, including their territorial boundaries. Thus, a competitive-related tension deepens socio-demographic and spatial inequalities when the bicycle is transformed into an advertising palette and *comunas* into competitive units for branding movements.

> When we tried to integrate the model of Las Condes and the model of 'BikeSantiago'… everything 'clashed' [both companies] disagreed... so if you keep looking at the issue from that point of view this is not a public service (LG3, August 21, 2017).

Resources via branding and advertising gave rise to constraints and restrictions regarding policy jurisdictions at the *comuna* level. Furthermore, this also expresses an asymmetrical relationship between the state and trans-national corporate firms regarding how such a novel mobility deployment might be governed, particularly under market-led principles.

7.4.2.2 Dilemmas in the organisational structure provision

In conjunction with flexible contracts, the final system comprised a de-regulated system with no legal framework for guiding either the operation or the bicycle trips as a formal means of transport.

A de-regulated system by design

Predictably, flexible contracts led to a 'lack of a control system' viewed from three perspectives: 1) the rationale of the agreements made, 2) the incapacity of the municipalities to monitor the system, and 3) a 'freedom' to operate.

First, the concerns of the various levels are fair regarding the symbolic contracts signed as they did not establish in practice a control system, and no rules could be

[13] www.bicilascondes.cl

applied to control the system performance; therefore, the operational levels seem like an act of good faith, similar to neoliberal philanthropic actions widely criticised in the literature (Chapter 4). Second, flexible contracts meant that municipalities lost their control capacities, disassociating them from operational levels.

> I honestly have to tell you the truth. For a long time, this contract has been unsupervised. It has had no supervision, none. We have not been able to - not that we have not wanted to - we have not been able to supervise... we do not make any gauges... the supervision of the service is minimal today, that is the reality... e.g. we claimed that the management system was not what we had defined in the bases. Then, we got into a situation of confrontation with the company (LG3 August 21, 2017).

Thus, the rationale of the collaborative agreements to include more and diverse *comunas* created at the same time several constraints to continue being involved at the operational levels. Thus, with "less principal" municipalities (RG1, August 21, 2017), it becomes evident that there are complex challenges and tensions arising from power asymmetries between trans-national relations and sub-national levels. Disagreements, unwillingness to audit, and misunderstandings at the time of applying some standards are expressions of these tensions that the interviewees mentioned.

Third, flexible arrangements and the absence of control systems also relate to a 'freedom' to decide on 'fleet management' at the operational level. Freedom to operate autonomously was part of the agreement made between the two business parties. Thus, what was agreed upon was a de-regulated BSS accommodated as a neoliberal philanthropic practice.

> We let the operator provide the BSS 100% autonomously. There is the brand, and we take care of the brand presence that is well installed on the bikes... we follow up, we observe, we are aware, but it (system control) is not part of a contract. (PS1, September 8, 2017)

No rules by context: legal ambiguity

Legal ambiguity characterises the new scheme deployment. As the bicycle and the new scheme were not yet recognised as part of public transport in Chile, a private rental bicycle scheme took shape as a legal form. Therefore, a 'public' bicycle here is, in practice, a private good under a rental scheme, accommodated under the context of the common goods via a membership scheme. This lack of legal regulation

led to three sources of tensions: i) a lack of access to a public transport subsidy, ii) a lack of fare integration into the formal public transport system, and iii) a normative framework to effectively apply a control system.

Expressions such as “the state's hands are tied” (PS3, March 15, 2017) exemplify the problem of deregulation and the lack of an appropriate legal framework to support the operational stages of the deployment. This deregulation and self-exclusion arise from the ideological principles underpinning the governance of these new deployments.

7.4.2.3 Dilemmas in the system performance: informational issues and control demand

Connected to organisational dilemmas, critical operational practices challenged the expected social outcomes. Informational issues and control demand were the most relevant themes in the interviews, despite the key performance indicators (KPIs) included in the tendering process (Chapter 6).

Informational Problems

Providing information on how the system performed was one of the duties agreed in the public tendering, as the quotation shows:

> To provide the system’s administration software, which must be approved by the municipalities that order this service, it must be able to access this software and the information that it must provide, at all times.
>
> The concessionaire will incur a fine of 5 MTU [see Table 7.3] for the delay in the delivery of the monthly information on statistics and management (Collaborative Tendering, 2014:8)

However, informational issues had three critical sides: i) the shared information and the way the operator must deliver it, ii) software management, and iii) a lack of information on complaints given by users.

Regarding the way that the operator delivers the information of the system, even when municipalities periodically received reports on the system performance (i.e., how many trips were made by bicycle, busiest stations, among others) these reports were questioned as the information is out-of-date and solely managed by the service

provider. On the other hand, the financial information related to operational cash flows is questioned due to a lack of information in this regard. This issue was crucial to provide a public subsidy, which blocked such public involvement. Preconditions and operational agreements must be in place to establish a minimum level of transparency.

Related to the software management, the information was solely managed by the service provider in a completely private scheme, as mentioned before. Having deployed a de-regulated system, the service provider ultimately decides what information to share and with whom. For example, information on complaints at the local level is valuable for community liaison management. However, there was a lack of involvement between the sub-national levels and the users in this regard. In general terms, there is a generalised call for an understanding of the system performance, such as the number of people registered, their complaints, as well as the current records of available bikes circulating. Thus, considering these lines of dispute, informational design and management evidenced critical issues in transparency, awareness, and ethics in particular regarding the digital platform and the 'shared' information provided. Thus, 'asymmetry of information' (Ostrom et al., 2014) says much about an 'enabling' state unable to address risks and failures as a result of design issues. In doing so, the most damaged by this type of decision-making are people requiring an alternative and affordable means of transport.

Motivational issues: control demand

Fleet management is one of the most critical factors when looking at a performance-based BSS system on dock-stations, both in terms of system coverage and service quality.

> To move bicycles from the stations where they are accumulated to the distribution stations that require it, not having a station without a bicycle for more than an hour. A minimum of one logistic vehicle per *comuna* is required. (Mercado Publico, 2020. Administrative basis of the collaborative tendering, p:8.)

Vitacura, Lo Barnechea, and Ñuñoa *comunas* tendered first a total of 880 bicycles and 83 docking stations, establishing a local character for the BSS management. Within the second phase of tendering, considering the 11 *comunas,* the operator defined a logistic strategy at key points when the system reached full capacity. This strategy significantly increased some docking station supply capacity during peak

times, transforming the automatised BSS into a mixed-manual system BSS at strategic locations marked by greater demand.

> For us, it was quite critical to have (first) *comunas* with a low-flow (and then) intra-*comunal* trips…. For us, it was very complex to expand (the system) … so we learned day by day... it was complex to first understand the idiosyncrasy… to observe the flow of bicycles, to redefine some stations regarding the residential and commercial sectors... we had nothing pre-established, and we processed as we went along... (PS4, April 25, 2017)

Since any BSS operation scheme based on docking stations required an adaptation of supply chain management as docking stations increased, it is relevant to analyse BSS operational practices when facing the expansion from three *comunas* to a total of 14. In this regard, two operator-based logistic strategies were implemented:

a) A bicycle distribution circuit designed with certain strategic bicycle docking stations at its core (e.g. Providencia, Santiago)
b) Increased supply of bicycles at strategic bicycle docking stations during peak times

As in the description summarised above, in conjunction with the different tendering approaches, the strategic docking stations identified have been labelled as the 'lungs' of the BSS network by the BikeSantiago operator:

> We formulated the concept of the 'lung', which we call the bike collection for high usage times. We set aside an additional daily supply of approximately 400 bikes in Costanera Centre, 100 additional bikes in Pedro de Valdivia […] preparing the system we leave the main [docking] stations at their upper operational margin.
>
> We have a 'marshal' at some of the busiest stations [...] this person is taking the bicycles out of the 'lungs' and places them into the docking stations […] Bike collection always has to operate via the BSS card (PS4, April 25, 2017).

In practice, many additional bicycles were stored in nearby selected locations where bicycles were infused or introduced manually in the BSS docking stations by a 'marshal' during peak times to balance fleet management. Table 7.3 presents the additional supply capacity, called the 'lung' docking stations by the operator, highlighting that additional 'lung' bicycles at selected docking stations (e.g. Costanera

Centre in Providencia) significantly exceed the projected capacity in the tendering process. As a consequence, the BSS operator directly influenced the system usage and urban accessibility levels via a BSS fleet management strategy. Furthermore, the decision-making at operational level lies in four relevant urban transport attributes: i) the location and distance between docking stations, 2) the number of bicycles to be distributed, 3) the number of logistic vehicles available, and 4) the logistic route decision. Thus, all those relevant attributes defined the control demand. These urban attributes, in turn, conditioned the logistic route decision. In conjunction with the lack of legal recognition of the bicycle as a means of transport in Chile, all together it made it impossible to improve/extend the route distance and times for the logistic vehicles at peak hours. Thus, focusing on the rationale of the logistic decision, crucial urban aspects were stressed, which influenced the system's distribution and performance in the 14 *comunas.* As a consequence of these disregarded urban attributes, the BSS operator directly influenced usage levels at some stations, which had social inclusion and accessibility implications.

Thus, having presented all these operational challenges, it was impossible to ensure a rebalancing in the 14 municipalities, as market principles, budget constraints and urban conditions guided the distributive principles by default. Informational problems also influenced the system management and administration, impacting the distributional patterns as the information did not match with real-time performance and there was no widespread understanding of the system. As interviewees highlighted, there was no connection with users. Users' claims were inadequately attended to at this point. Furthermore, and facing budgetary restrictions, a lack of trust and a lack of regional political incentive to intervene deepened a disassociation between stakeholders, the service provider, and users.

Dilemmas in the system performance, information issues and control demand informed critical issues between policymakers and the operational levels. This suggests that regulation, transparency and an effective control capacity are critical aspects to deploy more inclusive and fairer niche-innovations.

7.4.3 Paradoxical institutional and organisational tensions

The nature of the public procurement introduced paradoxical dimensions involving two types of relationships 1) stability and flexibility, 2) certainty and uncertainty, not only contradictory yet inter-related demands embedded in the different and imbricated institutional and organisational goals.

7.4.3.1 Stability and flexibility

Despite envisioning a long-term operation based on active collaboration, flexible agreements gave the state a secondary role, conditioning the subsequent operational arena. In this regard, while in the long term it was expected that the state would be actively involved in the system's operation, the capabilities of the operator and their weak management capacities were, in fact, the organisational concerns in the short-term.

Moreover, the insufficient or non-existent public management capacity is a short-term rationale that positions the state as a secondary or non-existent actor. The decision not to intervene with a subsidy as well as the rejected public institution in charge entails a decision of abstention, in line with neoliberal governance principles. In this sense, an attempt was made to 'enable' social investment by creating novel and flexible agreements but simultaneously excluding the participation of the state and creating ambiguous or unfeasible roles. In other words, while the sponsor expressed a willingness to allocate voluntary resources bolstering a context of innovation, the answer given by the regional governance to foster inclusion was excluding its participation by promoting flexible and collective agreements. Thus, in practice, long-term stability was premised on the capacities of the operator, based on the principles developed in the regional business model as a short-term perspective. However, an ideal operation was not clear in the public contract either, as it was not ultimately a service provision. Similarly, in a subsidiary type of governance, stability could be interpreted as non-intervention or non-involvement, as a status quo of an absent state. Thus, this 'enabling' negotiation lacks support for "guaranteeing" access and inclusion to such a service, despite the collaborative efforts. These findings are consistent with the argument that the involvement of the state supporting these new technological niches in transport depends on the ideological lens with which the state is analysed (Docherty et al., 2018).

7.4.3.2 Certainty and uncertainty issues

It has also been discussed that there are certain models of shared mobility already installed and accepted, imposed upon by a 'system manager' (Docherty, 2018). In this tandem between uniformity and specificity, tensions faced at the operational levels expressed uncertainty and certainty issues. It is a fact that the operational levels of new systems have uncertainty issues. For example, forecasting the demand as well as the operator's management skills were the most critical issues in BikeSantiago. In particular, the fleet-balance strategy is an expression described as a 'manual process' to a 'lack of experience'; however, it is a common practice worldwide (Sari, 2015). However, the fact remains that the uncertainty in BikeSantiago lies in the disengagement of its actors regarding reported issues such as 'lack of control system monitoring', 'control demand', and 'informational problems'. Hence, while uncertainty was associated with a lack of previous experience operating the system in several *comunas* in Santiago, certainty was based on perceptions of an ideal performance where trust plays a key role.

Some mentions were related to the need to modify the operational scheme as those paradoxical tensions raised red flags. Indeed, with all these described issues, the financial sponsor replaced the service provider in 2018 with a trans-national service provider.

How to address the present dilemmas and societal challenges with a governance regime encouraging inclusion but absent, deploying un-coordinated and de-regulated models? This empirical analysis highlighted the common challenges and uncertainties that emerging early-stage niches may face. In such, wicked problems, complex solutions.

Chapter 8. The operational levels. System performance and perceived benefits of the BSS BikeSantiago

This chapter analyses the performance of BSS BikeSantiago, considering the first year of its full operation in the 14 *comunas* in order to understand the relationships between planning tools, agreements made and operational levels in both fostering and hindering more equal and inclusive mobility landscapes. In doing so, this chapter comprises two parts. The first part of this chapter (Part I) analyses travel patterns, service levels and perceptions of benefits derived from the survey carried out in 2017 to current users. Focusing on the system performance and the key performance indicators (KPIs) agreed in the public tendering (Chapter 6), an understanding of the critical factors at the operational levels is provided from the perspective of users.

As explained in Chapter 2, the quantitative phase of the present research comprises an examination of travel patterns, perceived benefits, system performance, and service levels through a BSS travellers cross-sectional survey carried out at the busiest stations, locations previously identified in the qualitative research phase (Chapter 7). The sample size (343) was calculated with the standard formula for a finite population (Aguilar-Barojas, 2005; Cochran, 2007; Bryman, 2016) in accordance with the data provided by the operator in 2017 and field observations. Thus, the first part of Chapter 8 comprises two subsections. Sub-section 8.1 offers a socio-spatial setting, and subchapter 8.2 analyses the travel patterns, scheme performance and service levels by a descriptive statistical analysis of the cross-sectional survey, including tensions experienced by current users derived from service levels. This information and procedure were important for this research, as no public authority was monitoring the system's performance, and it became crucial to observe the current isolated position of the travellers in the deployment process.

The second part of this chapter (sub-section 8.3) comprises an integration and discussion of results between the three analytical chapters (Chapter 6, 7 and Chapter 8 Phase I). As further explained in Chapter 2, this research applied a convergent research design to analyse both qualitative and quantitative databases concurrently in order to address the research question. Indeed, a convergent analysis demands a space to reflect and expand the findings giving rise to links between the different decision-making scenarios to address a mobility justice transition research. The integration of results here is done through the MLP narrative (Chapter 3 and 4)

(Cresswell and Plano Clark, 2011; 2018) by applying the analytical model posed at the end of Chapter 4. Here, this thesis argues that the maintenance of a BSS is significant in the levels of adoption and benefit perception, which is determined by decision-making processes for its deployment.

Thus, the different decision-making and the operational practices comprised in the first inter-*comunal* BSS provide relevant linkages to create a transition narrative, connecting the key concepts of the MLP and mobility justice derived from the analytical model at the end of Chapter 4. This is an expanded version of Saud and Thomopoulos (2021).

8.1 A socio-spatial background in Santiago

Prior to analysing the system performance and perceived benefits of the first inter-*comunal* BSS in Santiago, a socio-spatial background is incorporated to contextualise the data. The government Social Priority Index (SPI) (Table 8.1) is used here to visualise and compare socio-demographic *comunas* comprised in the present analysis to better understand their differences in terms of regional investment priorities expressed as a position in a ranking. This index is further explained in Chapter 5. Table 8.1 presents the *comunas* participating in the BSS by position, geographical sector, and priority in investment and Table 8.2 expands the ranking to the whole region, highlighting *comunas* participating in the BSS. For more details regarding the SPI index, please see Chapter 5. It is relevant to mention that while the Metropolitan Area of Santiago is composed of 52 *comunas* (Figure 8.1) 34 urban comunas comprise Greater Santiago, usually grouped into seven sectors: north, centre, east, north-east, south, south-west and north-west, as Figure 8.2 shows. The majority of the BSS stations are located in the central and eastern areas; however, this analysis involved a regional scale, in particular, to observe the travel patterns.

Table 8.1: Metropolitan Region of Santiago *comunas* participating in the BSS by geographical sector and SPI position. Source: Own elaboration based on the Ministry of Social Development data (2017)

Comuna	Position	Geographical Sector	Priority
Lo Prado	13	West	Medium-High Priority
San Joaquin	15	South	
Recoleta	19	North	
Independencia	20	North	Medium-Low Priority
Estacion Central	26	West	
La Florida	40	South-East	Low Priority
Maipu	41	West	
Santiago	43	Centre	
Macul	45	South-East	
San Miguel	46	South	

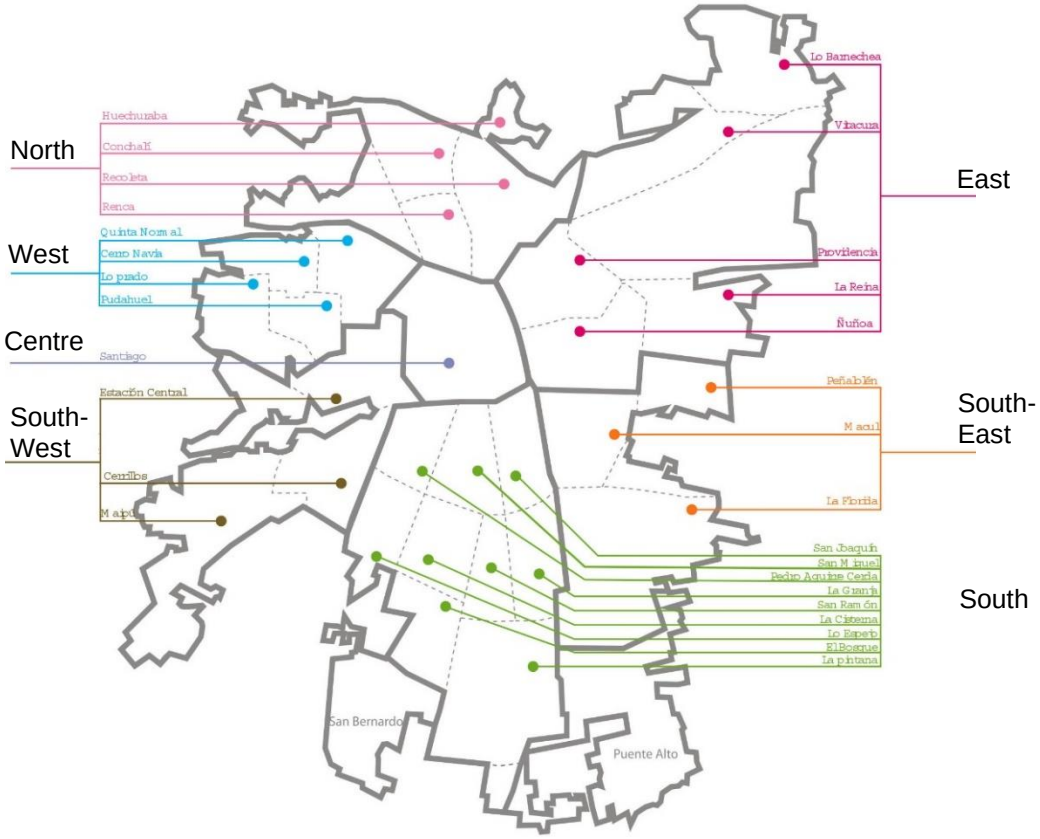

Figure 8.1: Areas within Santiago conurbation. Adapted from Caceres, 2015.

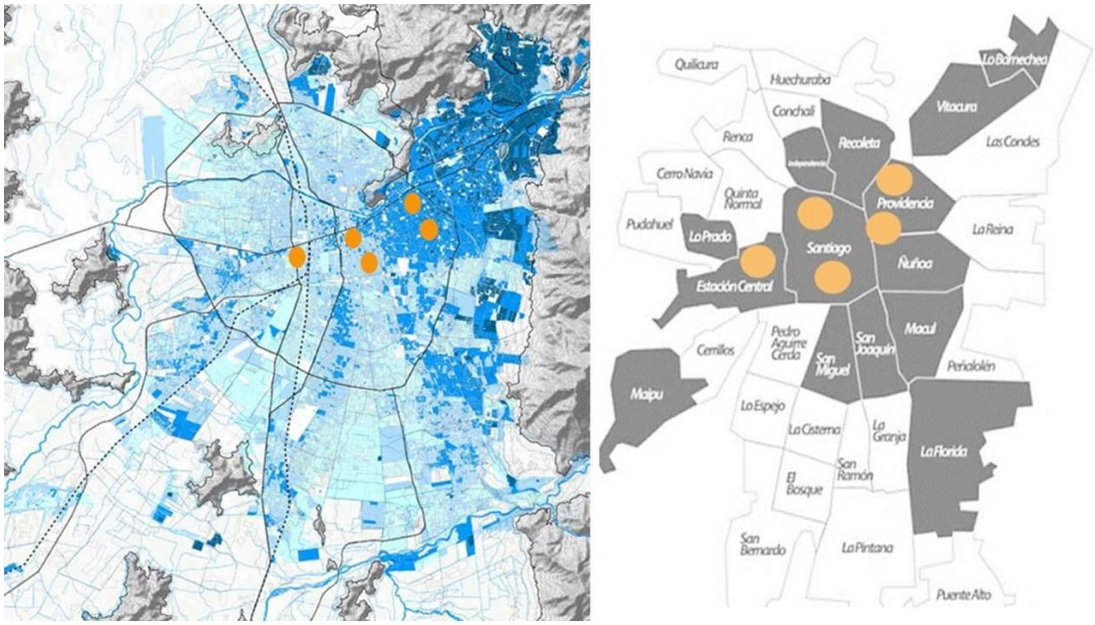

Figure 8.2: Socio-economic distribution map (left) and *comunas* participating in the BSS BikeSantiago (right) Dots in orange show data collection points. Wealthier areas in dark blue. Source: Own elaboration based on Santiago Metropolitan Regional Government (2016) and BikeSantiago webpage (2017).

According to the local BSS operator (B-Cycle LATAM SpA[14]) there were 33,146 registered BSS travellers, with 175 stations and 2,020 bicycles by September 2017, by which time the system had been operating for a year at full capacity in 14 *comunas* of Greater Santiago. As no single public authority coordinated the BSS operation of a fully private scheme, a unified public dataset of BSS usage at the local or regional level did not exist. Additionally, the qualitative phase highlighted operational issues regarding the first year of the BSS implementation (See Chapter 7). According to these contextual specificities, an observational study of the BikeSantiago scheme was performed before the survey to identify appropriate BSS strategic locations for the data collection process (Chapter 2). Figure 8.2 shows the *comunas* where the survey was carried out.

[14] Referred to as the 'operator' in the remainder of this thesis.

Table 8.2: Metropolitan Region of Santiago *comunas* and SPI position. In grey, *comunas* participating in the BSS. Source: Author's own elaboration based on the Ministry of Social Development data (2017).

Segment	*Comuna*	Rk
High Priority	La Pintana	1
	Lo Espejo	2
	Cerro Navia	3
	San Ramon	4
	Isla de Maipo	5
	Maria Pinto	6
Medium-High Priority	Curacavi	7
	Conchali	8
	El Monte	9
	Paine	10
	Melipilla	11
	Buin	12
	Lo Prado	13
	Padre Hurtado	14
	San Joaquin	15
	San Bernardo	16
	El Bosque	17
	San Jose de Maipo	18
	Recoleta	19

Segment	*Comuna*	Rk
Medium Low Priority	Independencia	20
	Til Til	21
	Alhue	22
	Lampa	23
	Quinta Normal	24
	La Granja	25
	Estacion Central	26
	Pedro Aguirre Cerda	27
	Peñaflor	28
	San Pedro	29
	Renca	30
	Talagante	31
	La Cisterna	32
	Pirque	33
	Pudahuel	34
	Colina	35
	Cerrillos	36
	Calera de Tango	37
	Puente Alto	38

Segment	*Comuna*	Rk
Low Priority	Peñalolen	39
	La Florida	40
	Maipu	41
	Huechuraba	42
	Santiago	43
	Quilicura	44
	Macul	45
	San Miguel	46

Segment	*Comuna*	Rk
No Priority	Ñuñoa	47
	La Reina	48
	Lo Barnechea	49
	Providencia	50
	Las Condes	51
	Vitacura	52

8.2 A survey of the system performance and perceived benefits of the BSS BikeSantiago in 2017

This sub-section seeks to clarify the system's performance and perceived benefits for travellers while using the system. The survey questions focused on four dimensions: i) Socio-demographic profile, ii) General travel patterns, including travel patterns using BikeSantiago, iii) Perceived benefits, and iv) Perceived BSS performance and service level.

Two analytical methods were used. First, a set of descriptive statistics are shown using SPSS and R software to characterise the current travellers' profile, travel patterns, and perceptions regarding the service level. Second, alluvial diagrams and a circular dendrogram are used to visualise the BSS travel patterns as origin-destination flow maps across comunas within the Metropolitan Region of Santiago.

8.2.1 Socio-demographic profile

The analysis proceeds by describing the survey results in terms of age, nationality, gender, occupation, income, and *comuna* of residence of current travellers by BikeSantiago. Results indicate that the proportion of male travellers is more than double female travellers. Of 343 answers, 110 were female, and 233 were male travellers, 32.1% and 67.9% respectively. As shown in Figure 8.3, the age-range population mix by age and gender shows that most of the respondents were men in an age range between 25 to 29 (70.6%), followed by women (29.4% in the same age-range). The following majority group comprises an age-range between 30 and 39, with 35% women and 65% men. The majority of respondents are Chilean (85.1%).

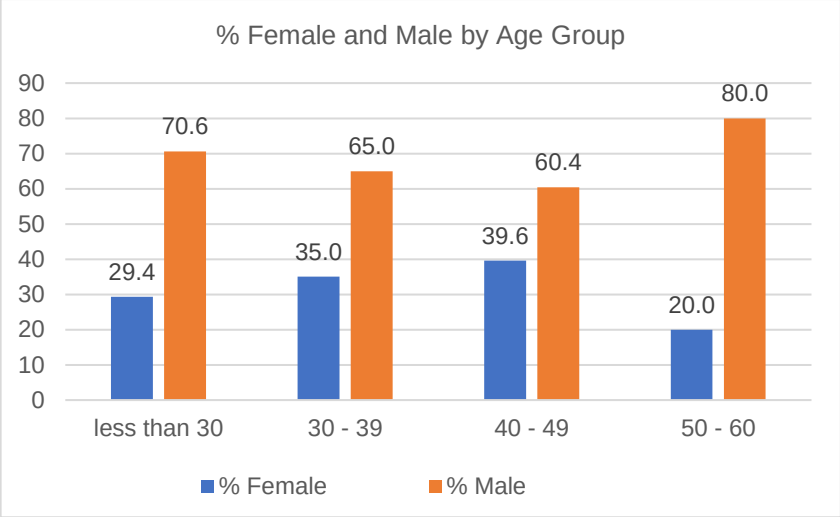

Figure 8.3: Survey respondents by age and gender. Source: Own elaboration based on survey data.

Regarding the main occupation or activity of the respondents, the majority stated that they are employees, with 85.4%, less than 3% are students, and 6.1% are self-employed (Figure 8.4). Commuting was the main purpose of travel by BSS, with 89.5%, as Figure 8.5 shows.

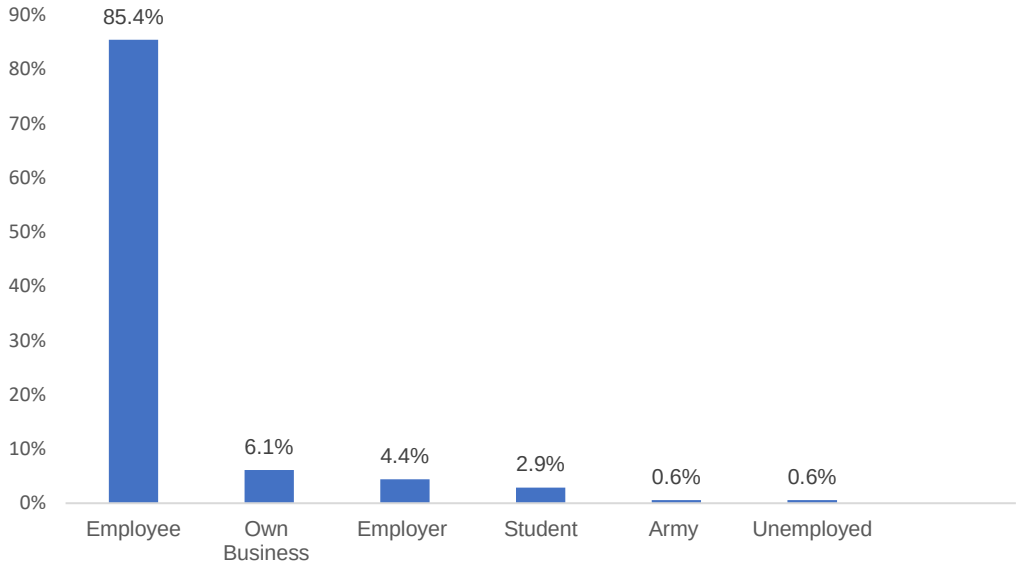

Figure 8.4: Occupation of survey respondents. Source: own elaboration based on survey data.

As shown in Figure 8.6, 82.5% of respondents had 16 years in education, indicating that they have a higher education degree compared to the national levels with an average of 11 years (National Institute of Statistics, 2017).

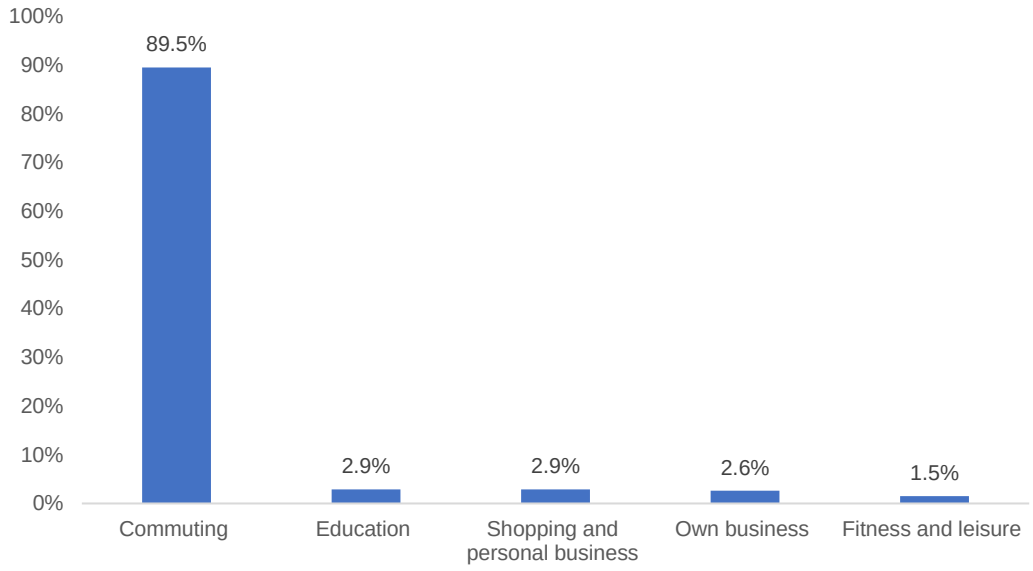

Figure 8.5: Purpose of travel of survey respondents. Source: Own elaboration based on survey data.

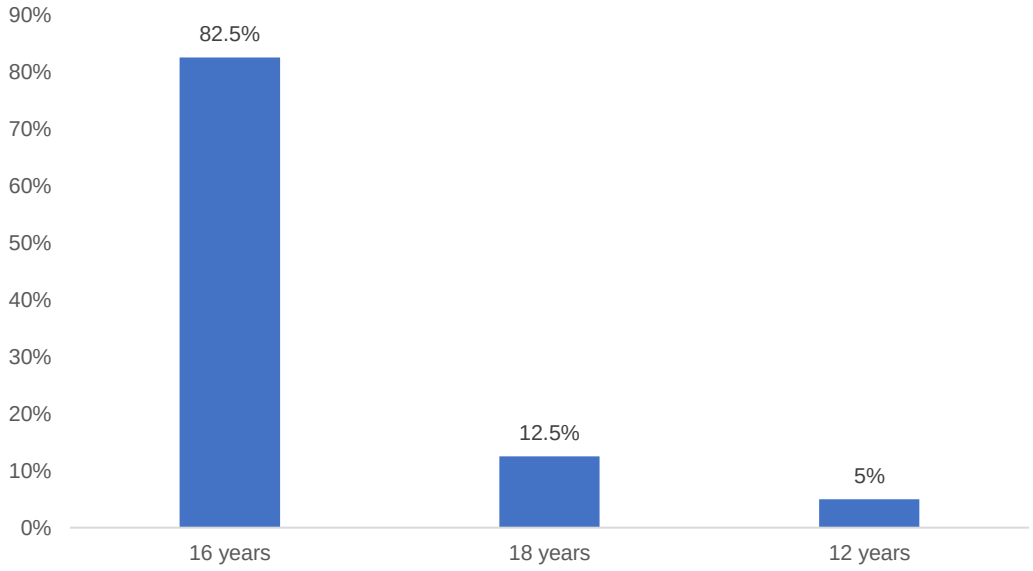

Figure 8.6: Number of years in education of survey respondents. Source: Own elaboration based on survey data.

Concerning the 'declared income' by quintile number of the households, quintile 4 represents the highest group of current travellers, followed by quintile 5, with 41.4% and 38.5%, respectively, as Figure 8.7 shows. Almost 80% of the survey respondents are, on average, part of the fourth and fifth quintile groups, showing a higher socio-economic level than the general average of Santiago's total population (Ministry of Social Development, 2015).

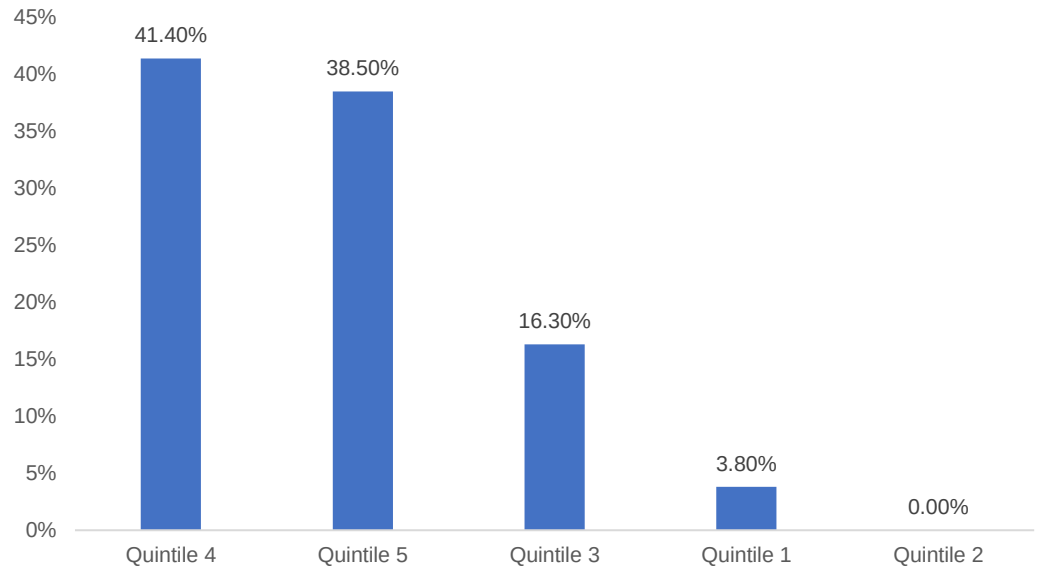

Figure 8.7: Income (quintile number by household) of survey respondents. Source: Own elaboration based on survey data.

In terms of place of residence, the most significant proportions of survey respondents live in the central and eastern areas of the city, 39.7% and 23% respectively, reaching a total of 62% (Figure 8.8, for more details, see Figure 8.1 and 8.2). *Comunas* were grouped according to census districts, as in Figure 8.1. Central and eastern areas of Santiago represent 'the high-income cone' in Santiago and are closely connected to the high educational and income levels of a large proportion of BSS travellers, as shown in Figure 8.8.

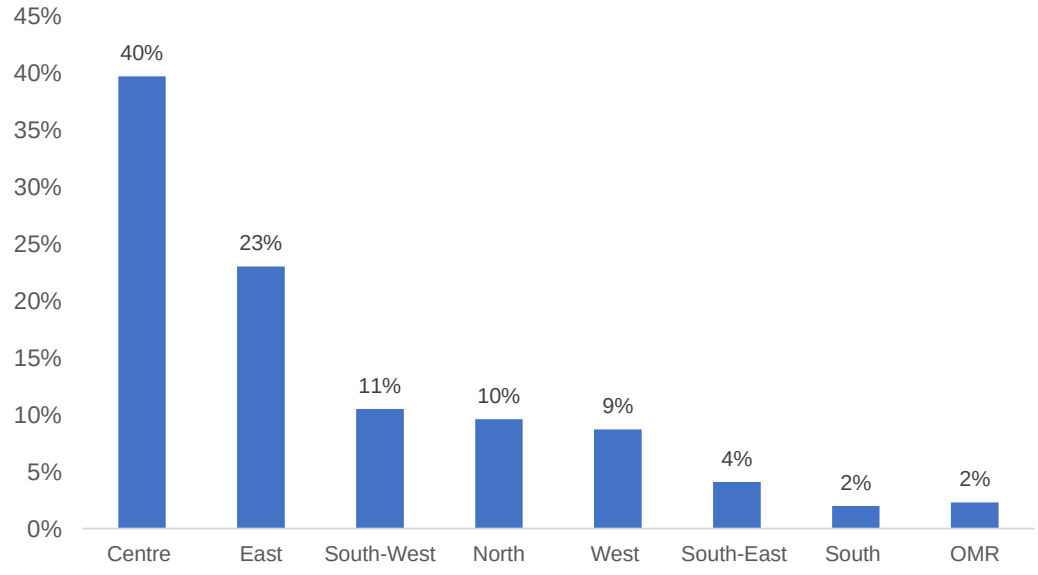

Figure 8.8: Residence by sector or areas in Santiago of survey respondents. OMR: Outside Metropolitan Region. Source: Own elaboration based on survey data.

By clustering the data with R software, the most common profile of respondents corresponds to the following characteristics. A large share are Chilean males, employees who commute, with an average of 16 years in education. They declared a household income between the quintile 4 and 5, and a place of residence in central or eastern *comunas*. Finally, they are mostly young people, with ages ranging between 25 – 29 and 30 – 34 years old, as shown in Figure 8.9.

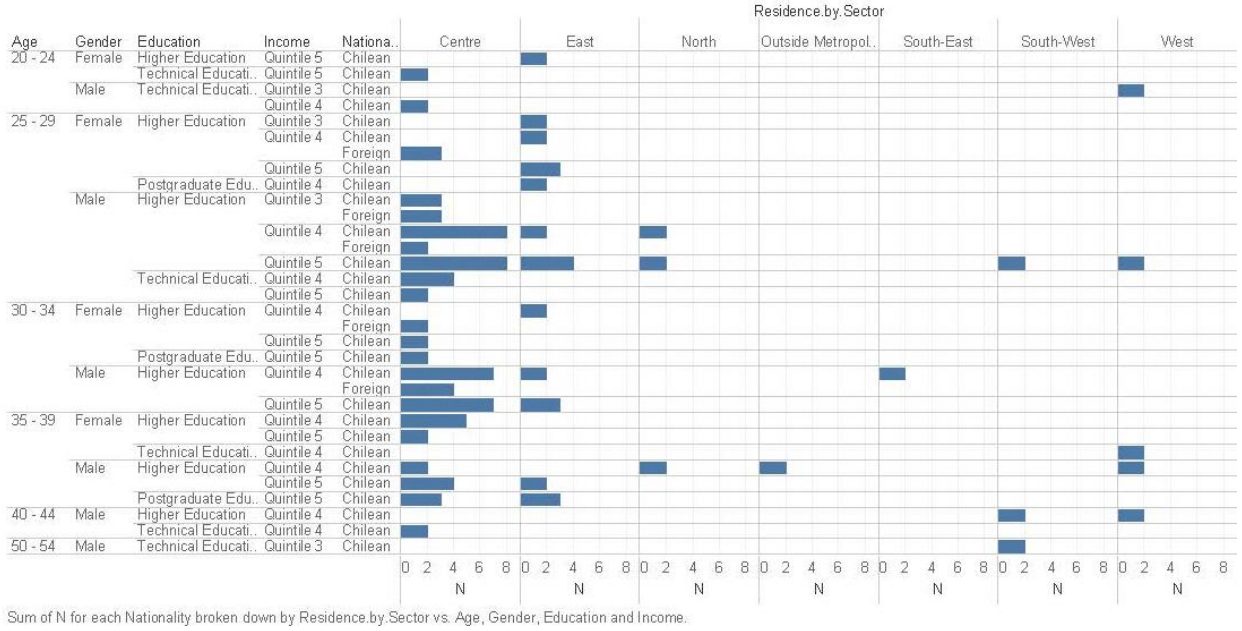

Figure 8.9: Socio-demographic cluster of survey respondents. Source: Own elaboration based on survey data.

Conclusions relate to the young male-dominant profile of responses. Therefore, there are evident biases in terms of gender, age, place of residence, educational level, occupation, and income with a dominant profile -or a profile by default - that constrains more equal and socially inclusive transport deployments. Results are in accordance with similar studies in countries such as the UK and the US when looking at inequalities based on the profile of BSS current travellers (Ogilvie and Goodman, 2012; Goodman and Cheshire, 2014). In this regard, the main results were consistent with earlier findings regarding the BSS traveller profile in bike-sharing literature worldwide, where women and residents of deprived areas were under-represented among BSS users.

8.2.2 Travel patterns

The survey analysis offers an explanation of travel patterns in two ways. On the one hand, an overview of travel patterns at the *comuna* level considered a visualisation of collection and return areas. On the other hand, information regarding the *comuna* of residence and *comuna* of occupation was integrated into the previous data of *comunas* of collection and returns to visualise general travel patterns when using the system.

Data visualisation through circular dendrograms in conjunction with an innovative application of alluvial diagrams have been selected as the most appropriate method to present and visualise the BSS travel patterns as origin-destination flow maps across *comunas* within the Metropolitan Region of Santiago. Thus, by using alluvial diagrams as a static image of left-right reading direction, travel patterns are visually illustrated as flows that connect, in an abstract way, the *comunas* where bicycles have been collected and the *comunas* where bicycles have been returned. At the same time, such an alluvial diagram allows the visualisation of the bicycle demand at each *comuna* illustrated as a black vertical bar for each *comuna.* Contrasting the black bars on each side of Figure 8.15, a snapshot of the flows between different *comunas* participating in the BSS is offered, facilitating the visualisation of the fleet management strategy (Chapter 7).

The survey also examined modal shifts, implying previous means of transport for a similar trip, inter-modality, or if travellers are combining BSS trips with other means of transport, the frequency of the common trips by BSS, and the level of usage. This section presents these data first to provide further information regarding travel patterns. Thus, as is shown in Figure 8.10, when asked about the means of transport used before the BSS for the same trip, it assumed that a shift from another means of transport for this trip is done when the comparative advantages are sufficiently significant (Rodrigue, 2020). 77.8% of the respondents said that the previous means of transport for a similar trip before starting to use the system was public transport (bus or metro), followed by walking with 11.4%, and car, with 5%.

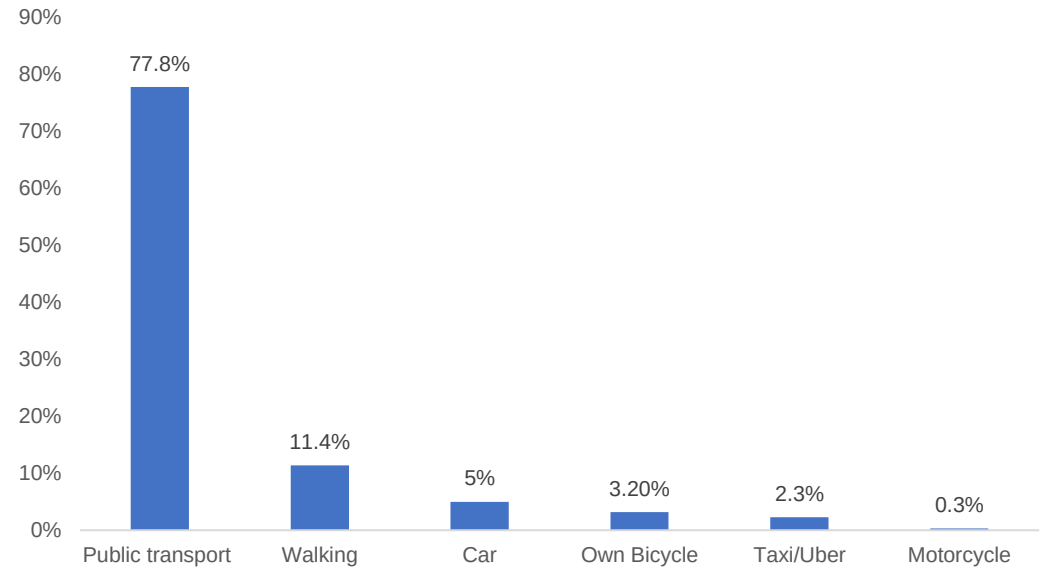

Figure 8.10: Modal shift. Source: Own elaboration based on survey data.

Inter-modality or multi-modality questions were asked regarding whether the most frequent trip using the BSS was also combined with other means of transport. 53.4% of travellers declared that they only used the BSS for the most frequent route, which includes a public bike, followed by combining a public bike with public transport at 34.4%, and a smaller group of people combined a public bike with a long walk, at 7.3% as Figure 8.11 shows. In addition, as shown in Figure 8.12, the majority of travellers expressed that the frequency of the most common trip was more than three times per week with 85%, which could imply that the majority uses the BSS for regular commuting trips.

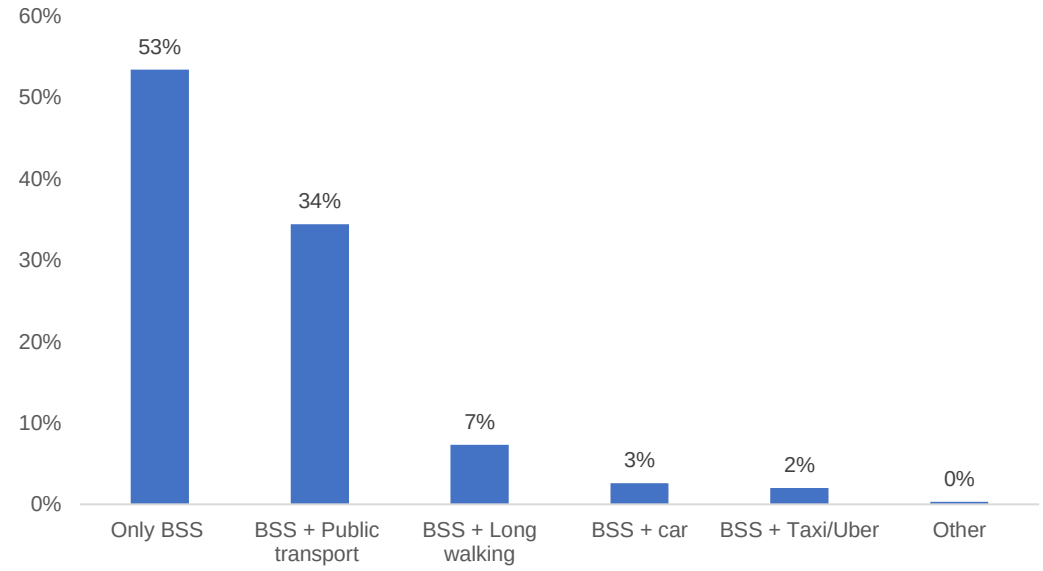

Figure 8.11: Inter-modality. Source: Own elaboration based on survey data.

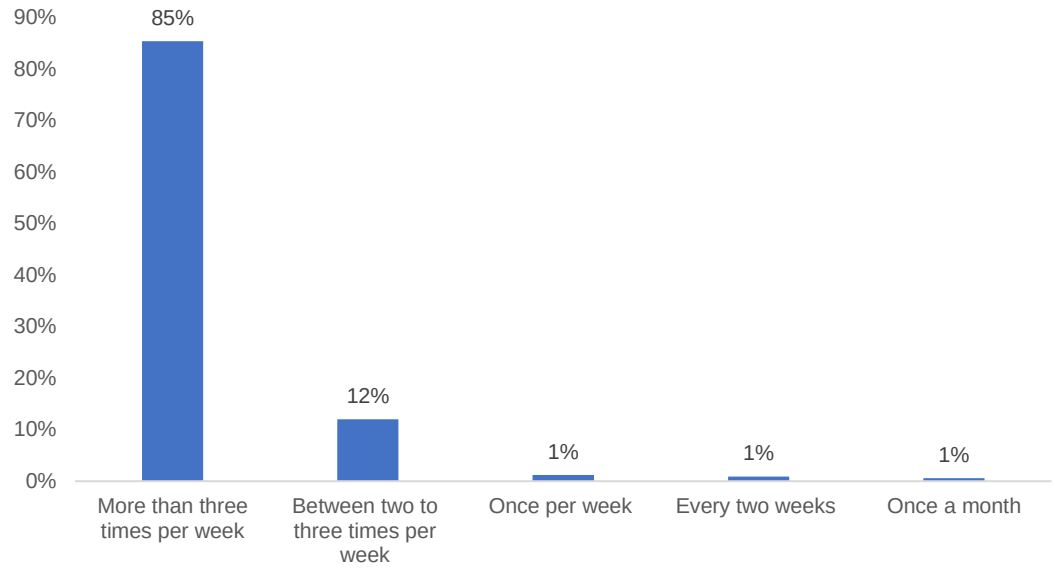

Figure 8.12: Frequency of the most common trip by BSS. Source: Own elaboration based on survey data.

The analysis of travel patterns was structured by combining the results of the *comuna* of residence, the *comuna* of main activity as well as the *comuna* of the most frequent bicycle collection and return. As shown in Figure 8.13, the main *comunas* of residence of respondents were Santiago, Providencia and Nuñoa, which are located in the centre and the east area of the Santiago Metropolitan Region. *Comunas* of main activity were Providencia, Santiago, areas of the greatest concentration of travel in Santiago, as in Figure 8.14.

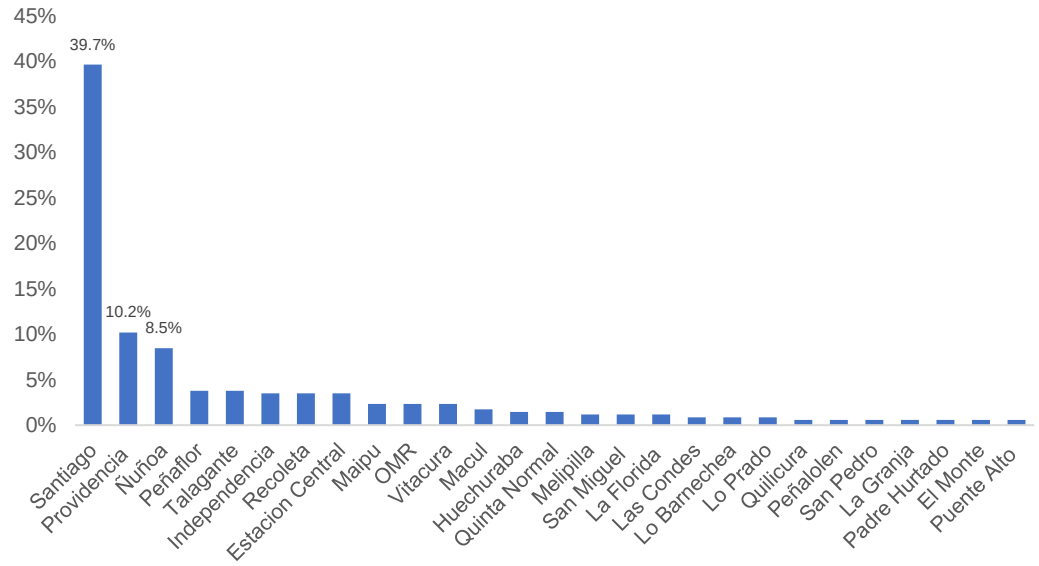

Figure 8.13: *Comuna* of residence. Source: Own elaboration based on survey data.

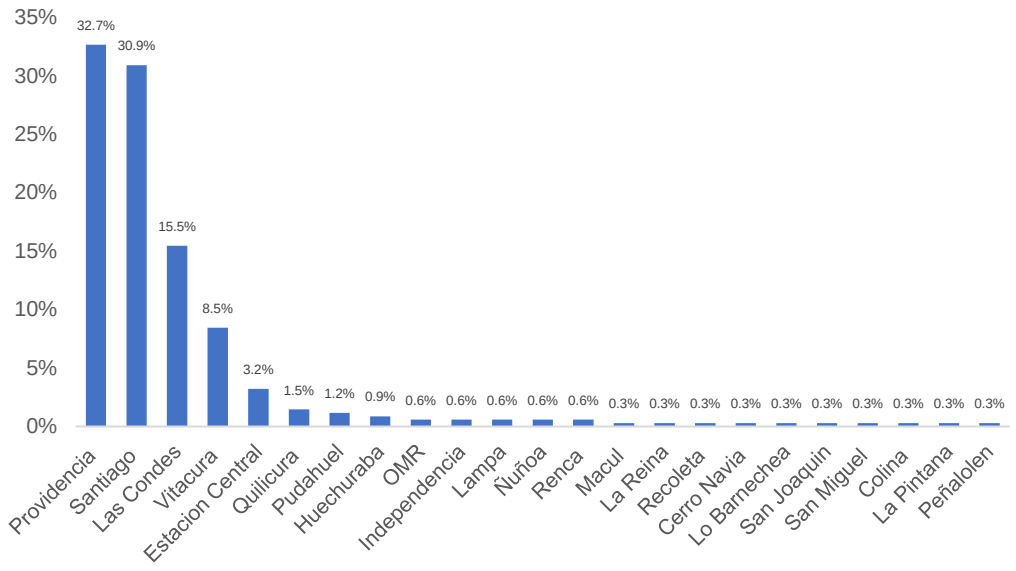

Figure 8.14: *Comuna* of main activity. Source: own elaboration based on survey data.

According to the Santiago travel origin-destination survey (2012), the beneficiaries of BikeSantiago are residents in the centre and north-east areas of the city (the wealthiest areas), areas with the highest concentration of trips in Santiago. Therefore, this initiative does not seem to be oriented to effectively support the travel characteristics of the city of Santiago regarding the high dependence of peri-urban areas on those areas of convergence of activities (Chapter 5).

8.2.3 Visualising BSS BikeSantiago travel patterns and fleet management in the first year of its full operation

Conventional flow maps based on origin-destination information – nodes connected by edges - have two-fold aesthetical challenges. On the one hand, in positioning and adjusting the nodes when locating them geographically, and on the other hand, in adjusting the geometry of the links or edges for optimal readability to accurately provide the relevant information (Benhard et al., 2016). As suitable methods to visualise BSS travel patterns, data are presented at the *comuna* level, generating figures via RAWGraphs (Mauri et al., 2017). This open-source data visualisation framework offers a quick diagrammatic overview of a database. Within RAWGraphs, circular dendrograms and alluvial diagrams have been selected as flow maps across *comunas* within Santiago's Metropolitan Region. The goal is to highlight specific variables within the travel patterns that characterise the system for both cases. Such

diagrammatic maps also help visualise relevant issues at the operational level, considering a context when information is not managed by a solely public authority and/or when it is a private asset.

In this regard, a general overview of the system demand at the *comuna* level is offered through Figures 8.15, 8.16 and 8.17, identifying the general pattern of the system at the regional scale as well as providing a quick visualisation of under-represented areas. Thus, while alluvial diagrams (Figures 8.15; 8.16) allow combining several variables, such as *comuna* of activity, residence collection and return point, in circular dendrograms (Figure 8.17), the focus is placed on two relevant variables, residence and return point *comunas.*

A static image left-right reading direction is used to build a travel pattern diagram to illustrate flows through alluvial diagrams. Here, the representation of BSS usage is done through connections between both black sidebars representing flows between *comunas.* The sizes of the sidebars also indicate the percentage of trips to and from *comunas.* Using the information displayed in Table 8.3, Figure 8.15 shows how *comunas* are participating in the agreed network, highlighting *comunas* here where bicycles have been collected and *comunas* where bicycles have been returned. For example, in red, all trips initiated in Providencia *comuna* are connected to different *comunas* where a bicycle was returned.

Moreover, Figure 8.15 also reports on the ‘lung’ fleet management (further details in Table 7.3 regarding the system performance and additional bikes, Chapter 7). This is possible to perceive when looking at the bicycle collection sidebar where Providencia and Santiago's *comunas* lead the origin of travel patterns due to the fleet management performed by the operator. Furthermore, it is possible to perceive that trips are not limited to a single *comuna* when looking at the bicycle return sidebar.

Figure 8.16 complements the understanding of flows with an overview of the BSS travel patterns. Here, the alluvial graph was made by combining trips between *comunas,* placing the collection and return *comunas* in the central bars. The sidebars represent the activity and residence *comunas*, thus connecting all *comunas* present in a frequent trip when using the system. In this way, it is possible to visualise schematically the trips made at the regional level and the *comunas* of origin and destination where the BSS BikeSantiago was incorporated.

Considering the case of Figure 8.17, this dendrogram diagram shows the relationship between the *comuna* of return and the *comuna* of residence as a part of a frequent trip when using the BSS. Here, while the internal points inscribed on the circumference represent the *comuna* of a bicycle return, the external points show the different *comunas* where people live. For example, people who ended trips in Recoleta comuna lives in Recoleta and Conchali *comunas*. It is important to note that the centre of this diagram does not specify the point of origin, but rather this diagram tries to generate the connections between two variables (comuna of bicycle return and comuna of residence) schematically.

Thus, a quick understanding of the system demand is offered by visualising travel patterns from this novel visual representation. These diagrams are a helpful tool for practitioners to take action when institutions face asymmetry information and thus have the relevant information available to improve the system performance in light of the agreed network.

Table 8.3: *Comunas* of bicycle collection and return. *Comunas* grouped as the first tier show those busiest stations with a pre-determined circuit of extra bicycles. The second tier of *comunas* are those more distant to the busiest areas and/or well/less attended by the operator. Source: Own elaboration based on survey data.

Comuna of Collection Point			
Comuna		Freq	%
First Tier	1. Providencia	168	49
	2. Santiago	114	33.2
	Total Busiest Stations	282	82.2
Second Tier	3. Estacion Central	23	6.7
	4. Vitacura	21	6.1
	5. Ñuñoa	9	2.6
	6. Lo Prado	4	1.2
	7. Recoleta	1	0.3
	8. Independencia	1	0.3
	9. Macul	1	0.3
	10. Lo Barnechea	1	0.3
	Total Under-represented (second)	61	17.8
Total First & Second		343	100

Comuna of Return Point			
Comuna		Freq	%
First Tier	1. Santiago	153	44.6
	2. Providencia	99	28.9
	Total Busiest Stations	252	73.5
Second Tier	3. Estacion Central	35	10.2
	4. Ñuñoa	15	4.4
	5. Vitacura	14	4.1
	6. Recoleta	9	2.6
	7. Maipu	7	2
	8. Independencia	6	1.7
	9. Macul	3	0.9
	10. San Miguel	1	0.3
	11. San Joaquin	1	0.3
	Total Under-represented (second)	91	26.5
Total First & Second		343	100

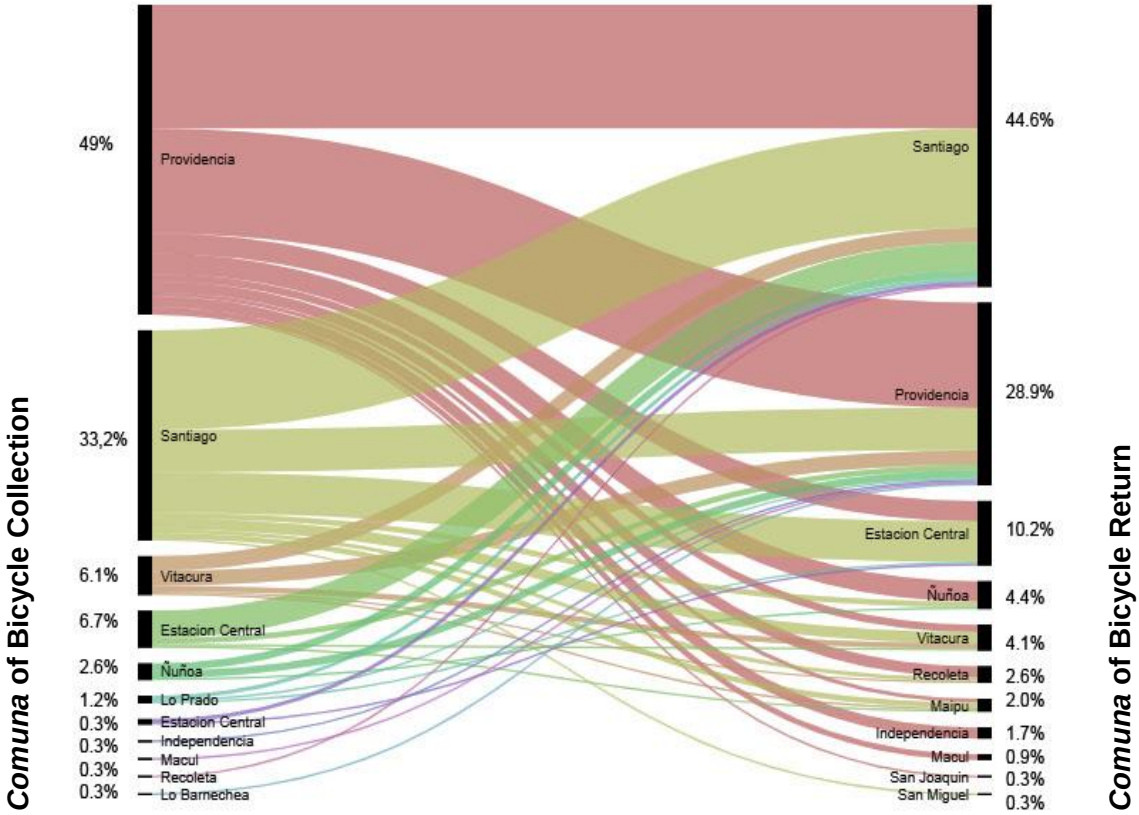

Figure 8.15: Alluvial map illustrating *comuna* of bicycle collection and return in Santiago. Line thickness represents the number of BSS travellers per *comuna* – Source: Own elaboration based on survey data.

As in Figure 8.15 and Table 8.3, Providencia, Santiago and Estacion Central generate the highest demand for bicycles. Providencia appears at the top of the list of *comunas* with the highest volume of bicycle collections (49%), and the greatest number of returns (28.9%). In addition, Providencia is also the *comuna* with the greatest inter-*comunal* scope, distributing the BSS trips not only to Santiago as the second largest and adjacent *comuna,* but also to more distant *comunas* such as Maipu and Independencia, as the alluvial diagram shows in Figure 8.15 (see also Figures 8.1 and 8.2 for details).

Linking travel patterns to urban socio-economic characteristics, the follow-up returns journey activity during the evening peak times (Figure 8.16), and the need to provide more docking stations at residential areas of certain *comunas* are expressed, for example, Ñuñoa, and Maipu, as well as the need to expand this BSS beyond the 14 participating *comunas,* for instance, Quilicura and Pudahuel. In turn, such

visualisation offers valuable insights about BSS travel patterns, which enhances not only fleet management efforts to ensure that bicycle supply matches the demand at selected stations but also can quickly highlight under-represented areas. These findings demonstrate that the time of day and particularly peak times significantly influenced bicycle demand and direction of travel correlated with the place of work and the place of residence (Table 8.3 and Figure 8.16). Thus, Figure 8.15 offers a general overview of the BSS fleet management at each comuna, and Figure 8.16 provides additional information regarding not only the trips made by the BSS but also a full overview of the journey by the BBS in Santiago.

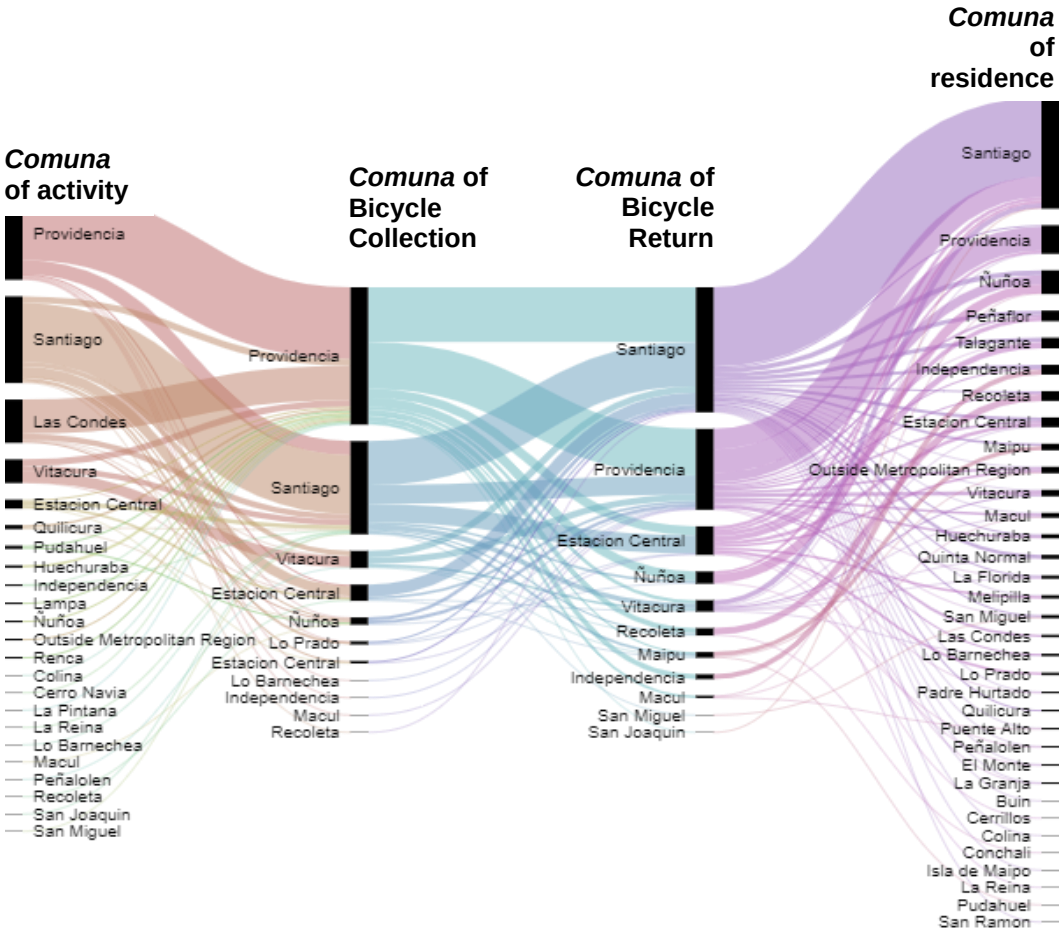

Figure 8.16: *Comuna* of activity, bicycle collection, return and residence in Santiago Metropolitan Region. Line thickness represents the number of BSS travelers. Source: Own elaboration based on survey data.

As Providencia, Santiago, Las Condes and Vitacura are *comunas* with the most travel attractions, numerous collection stations and a sufficient bicycle supply are offered there in addition to having a different type of contract. As they are the

wealthiest areas of the city, they receive, therefore, more attention from the operator. Interestingly, Las Condes is a *comuna* adjacent to Providencia, which is also a travel attraction area, and some BSS respondents stated having picked up bicycles crossing the *comuna* boundary.

Furthermore, Chapter 6 and 7 explained the co-existent BSS -BiciLasCondes-, which effectively is a substitute for BikeSantiago inside its territorial boundaries. Unfortunately, these two systems are incompatible with each other, both technologically and in regard to their business models and consequently compete with each other. Regarding the relationship between bicycle return and the *comuna* of residence, Table 8.3, Figures 8.15 and 8.16 also show that BSS respondents are not only residents of the 14 comunas participating in the BSS but also of peripheral (e.g. Puente alto, and Peñalolen) and rural comunas (e.g. Talagante, and Peñaflor), highlighting the inter-comunal and multi-modal character of this BSS. It is important to state that the docking station at Estacion Central is located near the bus and train terminal offering multi-modal transport connections not only to rural *comunas* of the Santiago Metropolitan Region but also to other regions of Chile. Furthermore, Figures 8.15 and 8.16 highlight the challenge facing BSS managing organisations since it is evident that cycling journeys are not geographically confined to a single *comuna* in Santiago. In this regard, by identifying the under-represented *comunas* (e.g. Estacion Central, and Ñuñoa) when facing higher or lower demand at certain times of the day, a sufficient bicycle supply could be rebalanced. Under-represented *comunas* (Table 8.3) are those that face some demand for bicycle pick-ups or bicycle returns. However, they are not located within the central areas, so they are not prioritised in the fleet management, as discussed in the previous chapter regarding control demand.

Therefore, less attended stations relate to inclusion and accessibility. Although they were provided with a docking station and bicycles by contract, this does not guarantee the availability of bicycles at all times or that the station is in operation in practice (Figure 8.15). Additionally, the contribution of more distant *comunas* (e.g. Maipu) in the overall BSS network is illustrated (Figures 8.16 and 8.17), stressing their role in such a large network within a metropolitan region as well as the need for integrated multi-modal transport planning.

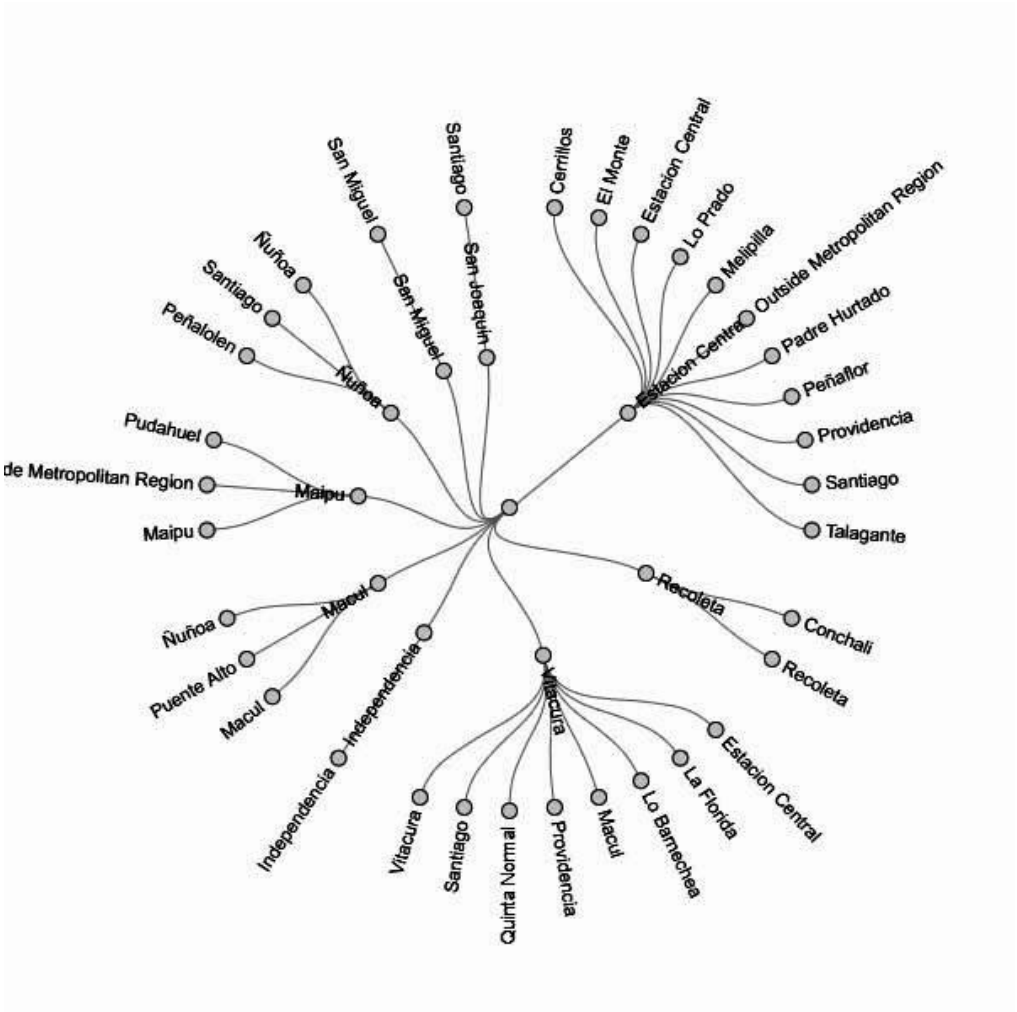

Figure 8.17: (Dots from the centre to outside) Under-represented *comunas:* return and residence in Santiago – Source: Own elaboration.

8.2.4 Perceived Benefits

BSS operational challenges alongside social and governance goals were also evaluated in the 2017 BSS survey. These categories sought to analyse perceived benefits when using the BSS for the most frequent trips to enhance evidence-based policymaking and support multi-modal integrated transport planning based on travellers' perceptions and preferences. Perceived BSS traveller benefits were assessed through four subjective variables: Improving health, travel time savings, BSS traveller costs (membership), accessibility.

Perceived accessibility was evaluated in the BSS traveller survey as "the ease of performing a frequent activity using the BSS compared to the previously used means of transport" (Chapter 3). BSS unavailability for travellers due to peak time demand,

lack of maintenance or other reasons were also explored based on a 7-point Likert scale (Strongly Disagree – Strongly Agree) applied throughout the survey.

In line with other cities worldwide (Carrasco and Lucas, 2019; Nikitas, 2019; Otero et al., 2018; Rojas-Rueda et al., 2011; Woodcock et al., 2014), improved health (85%) and accessibility (75%) were found to be the most commonly perceived BSS benefits (Figures 8.18, 8.19, and 8.20: Combined Strongly Agree and Agree responses). 77.8% of respondents who previously travelled in Santiago using public transport for the same journey, declared worsened health as one of the main consequences of system access deprivation (50.7%). Such findings express a negative travel experience faced by BSS travellers when using their previous means of transport, further explained in the next qualitative section regarding the public transport system. Travel time reliability was also a key element of the BSS perceived accessibility due to high congestion levels and lower reliability of the public transport network in Santiago, as the increased travel time faced by 24.2% of travellers. Similar to other cities worldwide (Nikitas, 2019; Otero et al., 2018; Rojas-Rueda et al., 2011; Woodcock et al., 2014), improved health was found to be the most common perceived BSS benefit (Figure 8.18 – Combined: Strongly Agree – 7 and Agree – 6). Indeed, the best benefit ranked was 'improving health' with a percentage of 63.3% and ranked 7 and with a mean of 6.36, followed by perceived accessibility. In general, BSS travellers gave accessibility a high rating. The highest was 6, with 41.7%, followed by 7 with 33.2% and with a mean of 6.03, as Table 8.4 shows.

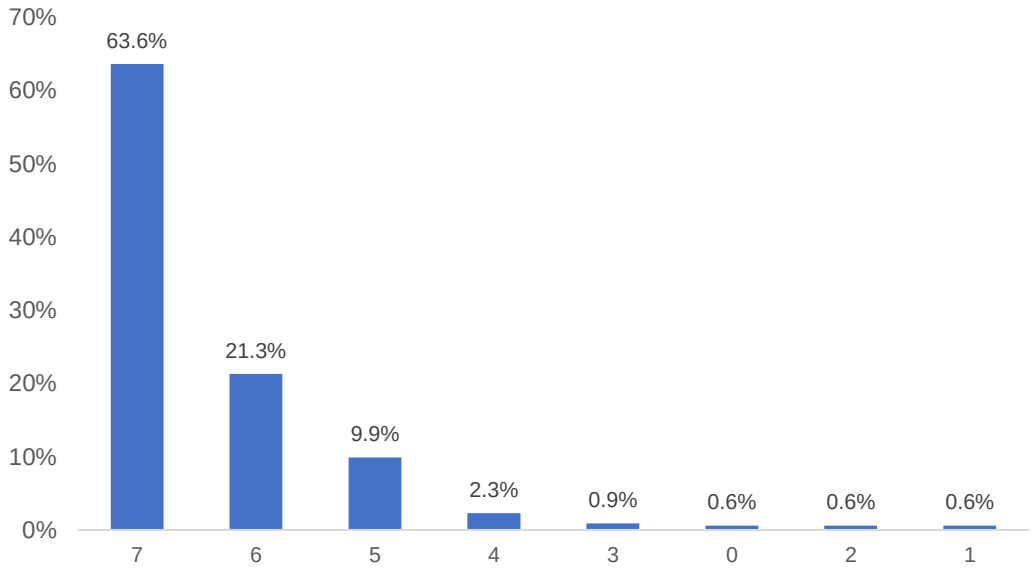

Figure 8.18: Perceived benefits improving health. Likert scale: 1 – Strongly Disagree, 7 – Strongly Agree – Source: Own elaboration based on survey data.

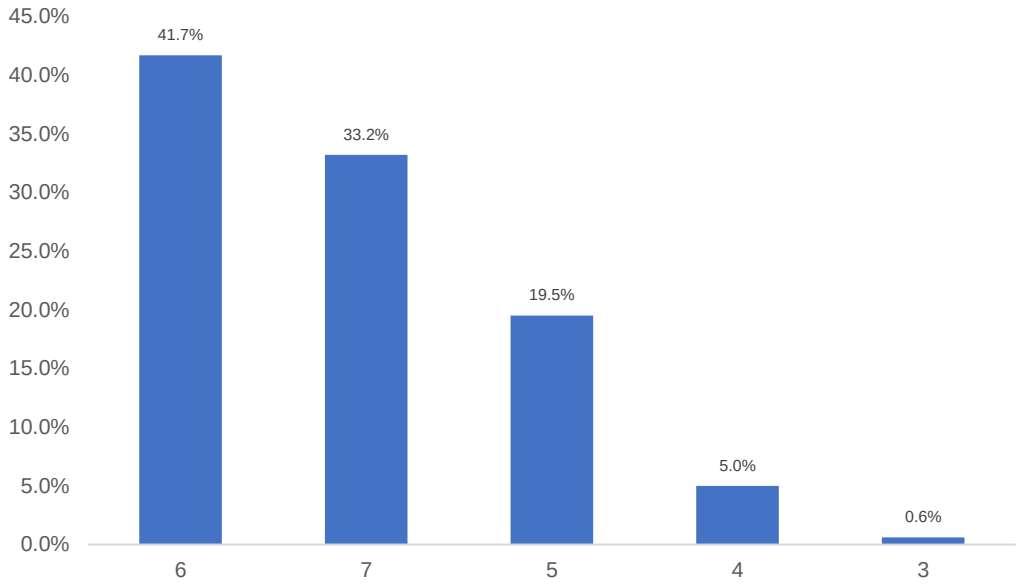

Figure 8.19: Perceived benefits in improving accessibility. Source: Own elaboration based on survey data.

The perceived benefit in saving money was the worst ranked, with a percentage of 40.5% with a score 7, and of 7.6% with a score of 1, as in Figure 8.20. Possible explanations of this low score could be related to the poor system performance.

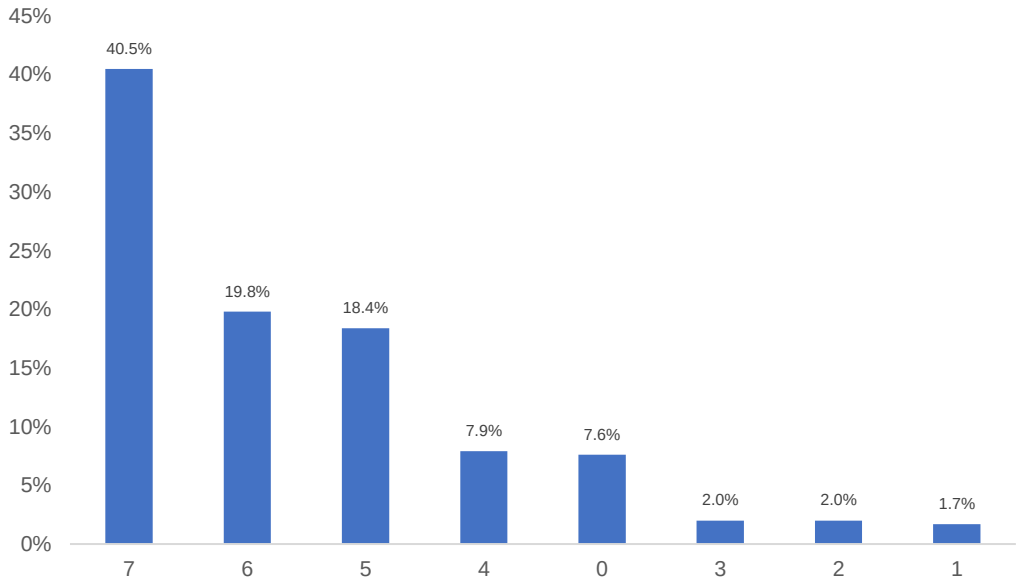

Figure 8.20: Perceived benefits in saving money. Source: Own elaboration based on survey data.

A hypothetical situation was offered to respondents whereby they might be deprived of access to the BSS (Figure 8.21). Therefore, worsened health condition was declared one of the main consequences of the hypothetical system deprivation, with 50.7%, followed by increased travel time with 24.2% and more expensive trips with 11%. This result relates directly to the negative travel experience that the current travellers face with the public transport system, according to the previous means of transport declared.

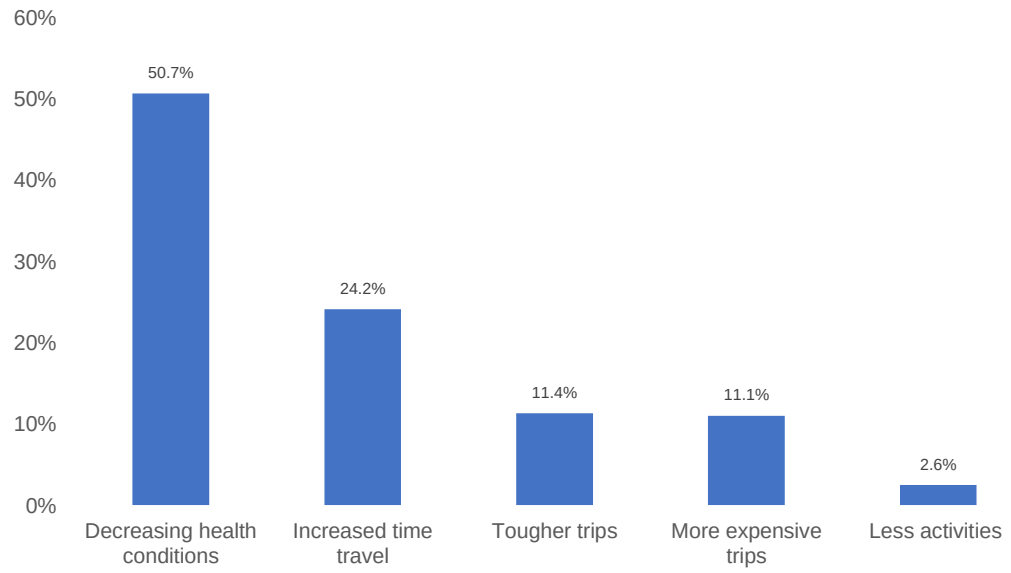

Figure 8.21. Consequences of system deprivation. Source: own elaboration based on survey data.

77.8% of respondents who previously travelled in Santiago using public transport when making the same trip declared decreased health conditions as one of the main consequences of system deprivation (50.7%). These results suggest a negative travel experience which BSS travellers faced in their previous means of transport, unhappiness about the public transport system, followed by increased time travel with 24.2%. Thus, travel time reliability was a decisive element of perceived accessibility benefits due to congestion and lower reliability of the public transport network in Santiago, following the previous means of transport reported (Figure 8.10).

In conclusion, the deployment of the first inter-*comunal* BSS in Santiago suggests that, combined with the generally negative perception of the mobility experience in Santiago, the BSS BikeSantiago could be contributing to reducing negative travel experiences. In this regard, the contribution of improving the travel experience can

be observed especially regarding health issues and accessibility to better performing day-to-day activities.

8.2.3 Perception of service level and system failures

The 2017 BSS survey also focused on service levels to provide links to perceived benefits. This led to an aggregate analysis of individual BSS traveller responses (micro-level) to evaluate the overall BSS service level (macro-level) and links to inclusion and inequalities. According to the review of the types of public tenders in Chapter 6, key performance indicators (KPIs) were agreed upon between municipalities and the service operator. The following items were evaluated through the BSS survey to assess the perceived service level, as in Table 8.4. This analysis was done with a view to supporting evidence-based policymaking, particularly in a de-regulated governance context such as Santiago.

Table 8.4: Descriptive statistics regarding perceived service level. Source: Author's own elaboration based on survey data.

		Available Information	Customer service communication	E-payment system	Price	System Coverage	Public Bikes Availability	Dock stations Availability	Public Bikes Maintenance	Dock stations Maintenance
N	**Valid**	343	343	343	343	343	343	343	343	343
	Missing	0	0	0	0	0	0	0	0	0
Mean		4.90	3.41	4.54	5.54	5.58	4.81	5.55	3.80	4.67
Median		5.00	3.00	5.00	6.00	6.00	5.00	6.00	4.00	5.00
Mode		5	5	7	7	7	5	6	5	5
Std. Deviation		1.660	2.178	2.301	1.490	1.378	1.404	1.305	1.537	1.545
Percentiles	**25**	4.00	1.00	3.00	5.00	5.00	4.00	5.00	3.00	4.00
	50	5.00	3.00	5.00	6.00	6.00	5.00	6.00	4.00	5.00
	75	6.00	5.00	7.00	7.00	7.00	6.00	6.00	5.00	6.00

Findings in Table 8.4 show that the mean perceived service level satisfaction by BSS travellers ranged between 3.4 (Customer service communications) and 5.6 (System coverage) in a 7-point Likert scale. Service level ranges from somewhat dissatisfied to somewhat satisfied. The lowest perceived system satisfaction levels were reported about customer service communication. Key users' problems with the BSS service

are summarised in Table 8.4, with e-payments and BikeSantiago bicycle and dock maintenance being identified as low-level service perceived. While bicycle maintenance issues encompassed wheel, seat or brake problems, docking stations maintenance comprises the infrastructure to collect and return a bike. Low BSS service level resulted in a perception of low BSS reliability by travellers, which in turn had implications for the perception of benefits in accessibility and social inclusion since certain travellers were blocked from completing their planned journeys by bicycle or even at all, due to these operational issues. Docking station maintenance (28.6%) was reported as a common challenge for BSS travellers to return a bike. Figure 8.22 highlights that BikeSantiago bicycle maintenance and the e-payments system were among the most common and concerning challenges BSS travellers faced. It is noteworthy that bicycle returns, data errors and e-payment problems are all intertwined, so this issue is further discussed in the next sub-section. To provide an overview of how travellers perceived the service level in different *comunas,* Figure 8.23 summarises the average score by *comuna* of bicycle collecting stations. Thus, while *comunas* from the first-tier (Santiago and Providencia) scored between 4 and 4.6, *comunas* from the second tier scored better on those two issues. In general, station maintenance obtained a better score than the e-payment system due to bicycle hire process errors.

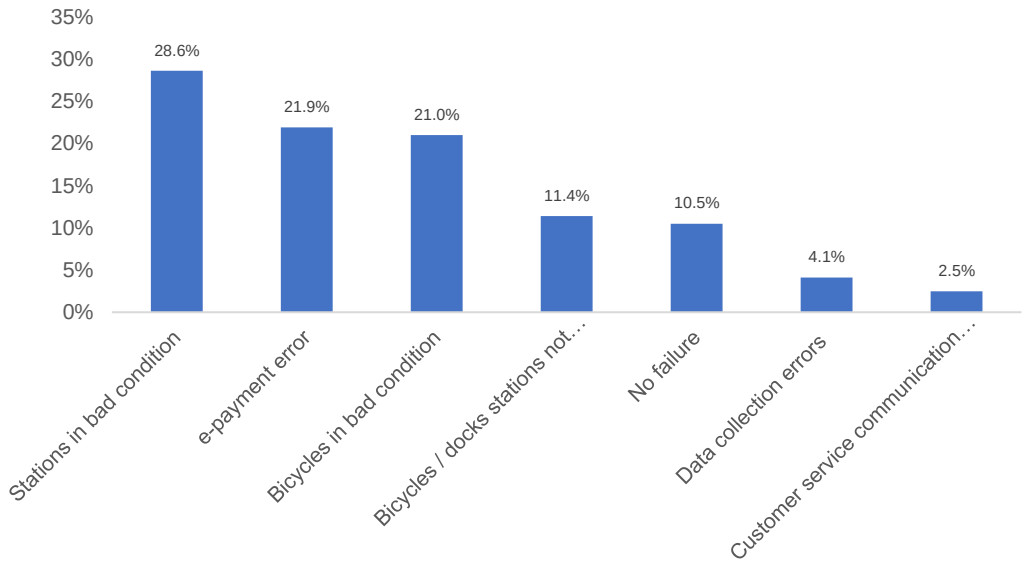

Figure 8.22: Main system failures perceived. Source: Own elaboration based on survey data.

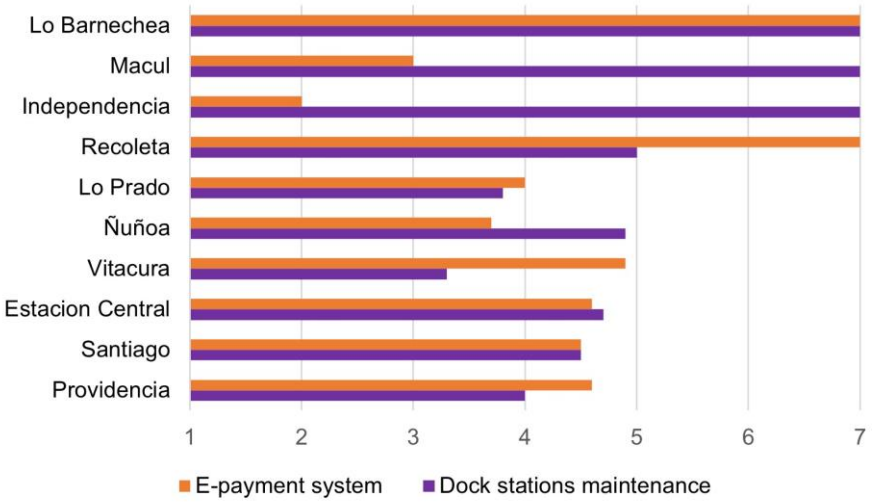

Figure 8.23: Main system failures scored by *comuna* about collection points. Source: Own elaboration based on survey data (Phase II). Orange bars represent the satisfaction level with the e-payment system. Blue bars represent the satisfaction level of the dock station maintenance.

8.2.4 Perceived accessibility and perceived service level

A regression was conducted to understand those factors underlying the perception of benefits while using the BSS, testing significant aspects of perceived service level and their association with perceived accessibility.

The model explained 23.3% of the variance in perceived accessibility and was a significant predictor of this outcome F (7, 335) = 14.57, $p < 0.05$. Of the predictor variables, three ratings were not found to be significant predictors of perceived accessibility – ratings of available information (B = 0.0036, P = 0.90), ratings of customer service communication (B = 0.020, P = 0.33) and ratings of the e-payment system (B = 0.025, P = 0.20). However, of the predictors that attained significance, the weakest role was played by ratings of docking station maintenance (B = 0.076, $P < 0.05$), followed by ratings of price (B = 0.092, $P < 0.05$), then by ratings of public bicycle availability (B = 0.10, $P < 0.05$), with the strongest effect exerted by ratings of system coverage (B = 0.11, $P < 0.05$). Thus, robust coverage is one of the key factors in deploying a BSS, according to the perception of current BSS travellers. This finding suggests that improving perceptions of the availability of the BSS can be best served by ensuring that the system coverage is as extensive as possible.

8.2.5 A qualitative approach to the system performance

Considering the survey limitations and its sampling in the busiest stations, additional short questions were carried out with 35 travellers (See Appendix B2). Two open-ended questions were added at the end of the survey, asking about their positive and negative experiences while using the system, stressing perceived benefits in accessibility (Lättman et al., 2016; Martens, 2017) and their experience with their data and records while using the system. 10% of survey respondents were interviewed based on convenience sampling and stratified by gender at each station. The analysis was organised by first identifying the themes associated with the previous service level assessment as well as the perception of benefits. Then, the links between the issues raised were recognised, emphasising the relationships established between them based on their argumentation.

As a qualitative analytical approach regarding the system performance, the system performance is valued by current travellers by describing their experiences. They highly value the health benefits as it reduces the stress associated with the negative experience of public transport and the consequent improvements related to active travel. Time-saving speed, comfort and convenience are also associated with their experience, in conjunction with reducing the disadvantages associated with using a personal bike, such as parking and risks of theft. Positive experiences such as freedom and autonomy came from women when they compared the system to using a car. Here are some BSS travellers' quotes about these issues:

> My overall experience has been good in the sense of being able to use a mode of transportation that can return you to other places and not having to leave your (personal) bike parked' (U09. Woman, Costanera Centre station)

> Using the bicycle is priceless, much more comfortable and faster'. (U08. Man, Costanera)

> it is a convenience for me, basically, because if I buy one I would have nowhere to park it (a personal bike). (U017. Man, Estacion Central Station)

> It's a relief... before I used to use the Metro. I used to arrive at the station, wait for the station to be full, wait for one wagon to pass and then another. (U019 .Man, Estacion Central Station)

> I feel more agile, ... (it) has helped me a lot… In that period, I was going through a lot of issues that were stressing me out, so I feel it was (better) thanks to the bicycle. (U021. Man, Estacion Central Station)

> The bicycle gives me an autonomy that a car does not. Because I don't depend on others. I don't have to wait 30 minutes for the bus' (U023. Woman, Teatinos / Moneda Station)

> I need to come home quickly because I need to see my baby, I need to meet work schedules (U024. Woman, Teatinos / Moneda Station).

On the other hand, the main concerns raised were e-payment errors, data collection from journeys made, and a lack of information (Figure 8.22). Most of the arguments tried to explain these errors in relation to the stations being in bad condition, involving concerns regarding the system performance. This was because the company cannot handle billing problems, and neither the company nor the government has solved the problem so far. Such difficulties triggered a series of in-depth interviews regarding the main system failures previously assessed, which made it possible for the study team to have a broader understanding of them. BSS travellers' quotes refer to these points:

> In October they say that I stole a bicycle. In October this (the application) did not exist. I didn't notice, and I paid it (the credit card), then I looked, and it came out (the bicycle) for 192.000 Chilean pesos (US$266)... they told me 'madam, the bicycle number xxx' is lost... you collected it and never returned'; however, it is not true! Maybe someone took it because the station was in badly maintained condition (U024. Woman, Teatinos/Moneda Station).

> The negative part is not being able to communicate effectively with the company and have the problems solved timely... they charge you more because they use the 'PAT System' [automatic payment from credit cards] that charges you automatically and then they can take whatever they want out of your account per month, and as many times as they want. Well, it seems to me that they do it because of the overtime.... That's why I try not to do overtime, and that's why they can't charge me anything more as they argued. If I go to my bank account, I see that they are charging me more... I sent an email, and they still haven't answered me for a month... I feel very insecure about the problem of not getting a response (U010. Man, Costanera Centre Station).

> My experience has not been very good… the service provider updated the BSS's application, but it does not show my trips (made). Now, I can't see the record of my trips... The biggest problem I have had is with respect to the charges. There are times when they charge you three times more... that makes you doubt whether or not to continue using the system (U07. Man, Pedro de Valdivia Station).

> Every day you find (bicycles with) bad brakes, punctured tyres, the handlebars to regulate it well... The conditions go from bad to worse, there is no technical service (that repair the docks and the bikes), there is no communication with the company directly... (U016. Man, Teatinos/Moneda Station).

Nonetheless, it is evident that an additional qualitative study is required employing, for example, interviews with a large number of BSS travellers, and non- travellers as well as former travellers, or alternatively structured focus groups. This would be in order to understand key barriers to the implementation of such a sustainable means of transport with broader social goals (Rietveld and Stough, 2005).

This second part of Chapter 8 is presented below, comprising the integration and interpretation of results through the lens of the analytical model developed in Chapter 4, in accordance with a convergent research design (Chapter 2).

8.3 Integration and discussion of findings (Phase II)

The integration and discussion are made through comparing the subject of study – the decision-making in the deployment process of the first inter-*comunal* BSS in Santiago, providing relevant linkages for a narrative in MLP and connecting key ideas with the mobility justice framework. This integration and discussion of findings aim to answer the research question How might a niche-innovation in transport lead to a mobility justice transition, considering the first inter-*comunal* BSS in Santiago, Chile in the period 2011-2017 as a case study? (see Figure 1.1, Chapter 1).

The case of BikeSantiago demonstrates the ways in which such a niche-innovation faces conflicts and complexities when aimed to expand the inter-*comunal* BSS in Santiago, a highly segregated metropolis in socio-economic terms, through collaborative practices at the sub-national levels. Indeed, the three analytical chapters (Chapter 6, 7 and 8, Phase I) showed that decision-making in collaboration is highly relevant in emerging mobility deployments, especially when facing a context with a weak regional governance capacity. *Comunas* as semi-autonomous decision-making units faced significant institutional challenges to tackle self-organisation practices. As the literature on Social Stratification and Government Inequality (SSGI) shows (Chapter 4), the lack of capacity of sub-national institutions to leverage and effectively implement initiatives at the regional level entails unequal distributive processes.

Therefore, the niche-level alignment by executing an inter-governmental agreement expressed signs of change from the initial configuration of the BSS deployment as a self-organisation practice in the three wealthiest *comunas* in Santiago. At the regime level, institutions took for granted the benefits of promoting cycling through this novel system under the premise that these models had already been proven worldwide. In addition, a local system was already in place (Providencia *comuna*), and a local system (BiciLasCondes, Chapter 6) was in the process of deployment. Hence, in conjunction with the perceived bicycle boom of Santiago as seen in its public policy and public investment (Chapter 5), all these convergent factors contributed to explaining a niche-momentum in cycling and, therefore, 'leveraging' an unprecedented inter-*comunal* system in Santiago. However, the BSS's deployment process faced significant institutional and organisational challenges to reach stability and meet the promise of effectively providing a service in 14 diverse *comunas*, which is a matter of mobility justice. This is discussed below within the MLP perspective presented in Chapter 3 and structured as an analytical framework in Chapter 4. This

discussion analyses the decision-making process to unfold its rationale and, therefore, the transition pathway to engage with the research question. The integration of the three analytical chapters draws empirical findings and assessment of: i) early decisions to deploy the first inter-*comunal* BSS in Santiago, ii) implementation process, and iii) operational levels, according to the sub-objectives.

8.3.3 Early decisions to deploy the first *inter-comunal* BSS in Santiago.

By integrating and discussing results through the MLP (Chapters 3 and 4), early decisions to deploy the BSS in Santiago sought to provide an understanding of the institutional rationale behind the BSS regional business model in order to analyse its role in triggering a mobility justice transition. The present discussion begins by discussing the transition pathway involving the BSS in Santiago, discussing then the role of the regional business model in establishing a trajectory of change towards a unified system.

The transition pathway took shape with an initial political decision from the regional executive, in turn, to start with the BSS deployment. This is a particularly novel and relevant decision in the context of Santiago Metropolitan Region as this is one of the metropolitan areas with the highest concentration of population and political power in Latin-America (Valenzuela and Ortiz, 2017; Brinkhoff, 2020, National Institute of Statistics Chile, 2020). However, the regional governance setting remains an unclear challenge in Chile regarding the lack of effective capacity to plan the execution of regional resources and address inequalities, due to the high centralism that characterises Chile (Eaton, 2004). In this regard, the conceptualisation of the sub-national levels through the notion of a metropolitan governance regime based on multiple local semi-autonomous decision-making units helped to illustrate that regional planning today consists of coordinating and transferring national resources between the various territorial levels of administration (Saud, 2014; Valenzuela et al., 2019; Henriquez, 2020). Thus, this lack of capacity faced by the regional level to actively participate in the deployment and effectively execute the resources allocated to subsidise the operation of the system was manifested from the beginning in the justification expressed in the regional business model for deploying the first inter-*comunal* BSS in Santiago, and was evident throughout the process analysed.

Early decisions showed that the regional government in Santiago was not able to create an adequate and competent institution to manage the operational level as well as not being able to provide a subsidy due to its institutional and political weakness.

However, the early decision to start with the deployment from the regional level suggests an adaptive strategy or a transformative institutional adaptation challenging the existing centralised top-down decisions and self-organised local government practices. This is when considering that the initial decision to deploy the inter-*comunal* system at the regional level is rarely in a highly centralised context such as Santiago. In guiding a potential BSS implementation, the regional business model played a key role in setting the challenging objective of incorporating a BSS into a formal transport alternative for Greater Santiago, as the argument to justify the public investment for its business model showed. Furthermore, the arguments that give rise to it are related to the required information needed to decide the 'best' alignment between multiple actors and resources. This brings them all together to create a niche as the support network or the instance of support. Thus, it is possible to recognise the regional business model as niche-innovation in transport, in line with the literature about transitions and bike-sharing (O' Tauma, 2015; van Waes et al., 2018; Geels et al., 2019).

As analysed in the regional business model, a set of values illustrates the interwoven network of key partners and strategic public-private negotiations, highlighting the emphasis in providing the best conditions for a business opportunity and illustrating through the analysis of value proposition, creation and capture how an 'enabling environment' took shape. However, this tool of planning disregards the real travel needs in Santiago, nor does it adequately address public values, as the financial assessment and its arguments showed in Chapter 6. Indeed, the spatial coverage of the BSS was built on assumptions regarding the current characteristics of the built environment and people, requesting a given quality of the built environment and mixed land-use in support of current travel patterns. In addition, the regional business model does not address how the state should invest in infrastructure to enable more inclusive access to the system, but instead, it develops a 'ranking' to select the areas. Furthermore, and according to the socio-spatial inequalities (the SSGI thesis in Chapter 4) and uneven distribution of the infrastructure and service that affect the metropolitan context in Santiago (Chapter 5), this ranking showed that most of the *comunas* with the best urban conditions are coincident with the wealthiest central and peri-central *comunas* of the region, despite the intention to include heterogeneous

areas. Thus, the regional business model can also be seen as a 'top-down' public policy as a dominant rationale, in accordance with the Social Stratification-Government Inequality (SSGI) thesis (Ostrom, 1983).

This finding suggests that the ranking illustrates a strategy of 'stratification' fostering socio-economic segregation, expressing a mismatch between resources and socio-spatial needs in transport when looking at the Metropolitan Region of Santiago *comunas*, their SPI position as well as distance and travel time in commuting. Likewise, here is highlighted the 'artefactual' and a ready-made solution with which a BSS in Santiago is planned. Moreover, findings within the value formula revealed a subordination of private values over public ones by emphasising the role of the private profit formula as an argument for the persistence of the system over time. The following arguments support this argument.

Firstly, when referring to the beneficiary population as a user segment, a terminology widely used in the private sector, the regional study assumed a modal shift from public transport, walking and current cyclists, all with a general travel pattern in the busiest areas of the city. Moreover, there is no concrete measure in this study to incentivise car replacement. This argument evidences a strategy to attract a larger user population more quickly to ensure the operation of the service rather than encouraging other motorised means of transport, in conjunction with the spatial coverage principles. This argument is consistent with Docherty et al. (2018:115) when arguing the intention of 'smart mobility' in creating markets in which "there is more mobility, not less, in order to maximise its returns", in accordance with an intense utilisation of such equipment as the heart of these business models for userships in shared schemes.

Secondly, value creation and capture analysis strongly support a partnership design based on a sponsorship-based business model as the best scenario, under the assumption that the state lacks the ability to implement and manage such a system but rather to provide the conditions for a private party to take over the operation, reinforcing the institutional weaknesses affecting the regional level in Chile. In this regard, the profit formula suggests a potential self-organised practice, subordinating private values over the public one, involving asymmetries of power relations and introducing a strategy of 'defection' (Chapter 3) to maximise private returns. 'Defection', in the regional business model, relates to the suggested type of contract based on the free concession strategy. Developed as a tax exemption, it sought to maximise private profits for an attractive business opportunity (Chapter 6). However,

as the analysis in Chapter 7 demonstrates, it implied weakening the decision-making capacity and deprivation of both a potential municipal revenue and the ability to establish sanctions on concessionary services. Therefore, to establish a transition trajectory of 'change' towards a unified system including different *comunas,* a destabilisation of the local government is proposed by this tool of planning. Similar to 'ranking' as a mechanism to perform social-spatial segregation by design, the profit formula also shed light on a mechanism of discrimination, e.g. planning an extra charge in more disadvantaged places. Decisions were argued on the basis of safety reasons and a given idiosyncrasy. However, it could also be seen as a strategy to maximise the expected private returns by discriminating against people on the basis of their place of residence and class.

These findings demonstrate a particular rationale in the design of niches at the sub-national level, in particular, by an envisioned institutional-organisation dynamic which is close to an 'enabling state' action or "just enabling the opening up of markets", (Docherty et al., 2018:117). These results are also consistent with van Waes et al. (2018) on the assertion that a business model is not sufficient to lift trajectories in transition research.

To sum up, findings from the analysis of early decisions on innovation showed the twofold role of the regional business model. This tool of planning expressed the intentions of replicating a dominant industrial recipe via stratification and defection as in the value formula strategy. However, an incipient adaptive strategy or a transformative institutional adaptation, as a subject of innovation, also challenged existing centralised top-down-policies and self-organised practices at this early stage of decision-making. In addition, the rationale of stratification and defection strategy for the envisioned deployment introduced significant institutional and social biases with potential effects in reproducing inequalities. Crucial institutional issues arising from these findings at the early stage of decision-making related to how to address public value via bottom up and integrative strategies when designing an effective institutional and organisational partnership to deploy an inclusive niche-innovation in transport. This idea implies recognising the specific institutional settings to address the integration of the various *comunas* in Santiago, and thus building more equal and inclusive transport landscapes.

8.3.4 The implementation of the BSS BikeSantiago

The implementation process in Chapter 7 provided an understanding of the sub-national decision-making when implementing the BSS BikeSantiago, highlighting the role of inter-governmental agreements when deploying the BSS in Santiago to tackle inequalities. Results in this chapter showed a comprehension of simultaneous patterns of self-organisation and collaboration as an interaction of path-dependence and change (see Chapter 3) illustrated by the tendering process. The discussion is elaborated through the MLP, giving rise to relevant links between the institutional and operational levels.

The first discussion from the implementation process relates to the institutional levels, by linking the regional business model and the tendering process. The analysis in Chapter 7 showed a link between the regional business model and what was tendered subsequently, considering that the business model is public information. Therefore, this link between early decisions and the implementation stage evidences a sign on a mechanism creating an 'enabling environment' in Santiago.

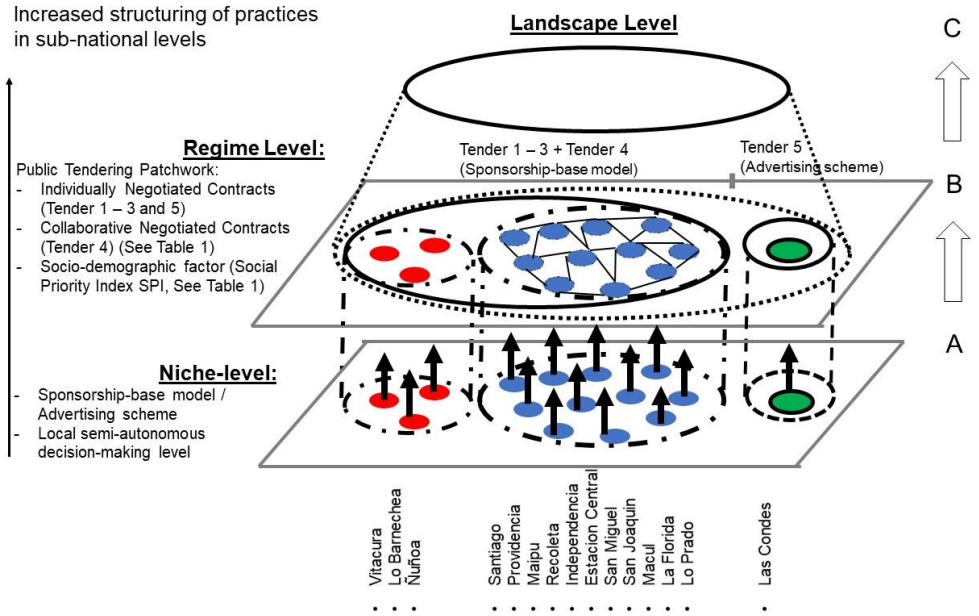

Figure 8.24. Nested hierarchy of multiple levels of decision making in Santiago Metropolitan Area. Source: Own elaboration based on Geels (2002; 1261; 2012:52). See also Saud and Thomopoulos (2021).

Moreover, while findings showed that the three self-organised deployment practices in the wealthiest *comunas* did not match with the regional business model proposal (neither regional transport needs), the inter-governmental agreement did match with the technical offer in almost all aspects of the technical offer, apart from a deployment based on a corporate sustainability practice (Chapter 4). This match is significant in this research as it is a decision that helped to tackle self-organised practices, which effectively helped to start a mobility justice transition towards more equitable and inclusive transport deployments. This link is illustrated by the MLP in Figure 8.24. Here, the niche level consisted of a novel alliance between different *comunas,* in the attempt to raise a 'mobility change' in Santiago. The niche-innovation in Santiago that finally took shape had a multidirectional relational level: the transnational level - a foreign financial sponsor in alliance with a private operator financing the system via flexible branding and lease contracts (the PSI scheme, see Chapter 4 and 7) - and several local semi-autonomous decision-making units connecting to them via free concession contracts. Thus, Figure 8.24 illustrates the inter-governmental collaboration to deploy BikeSantiago inter-*comunal* bicycle sharing scheme. At the niche level, it represents a local decision-making unit contributing to forming a new regional mobility regime via deploying a single inter-*comuna* BSS scheme in Santiago (moving from A to B – Figure 8.24). Through this niche-actor alignment, the regime level is reconfigured by different institutional arrangements considering individual and collective contracts, which depend on the socio-economic position of each *comuna,* as the public tendering showed. The resulting mobility landscape-level showed that the inter-governmental agreement effectively incorporated heterogeneous geographic areas to achieve a unified inter-*comunal* system. These findings expressed the relevance of the inter-governmental collaboration between local governments playing a leading role in bringing 11 *comunas* together and totalling 14 *comunas* with a unified mobility system. Thus, this collaborative practice manifests a transformative strategy, suggesting collaborative practice as an incipient sign for a mobility justice transition pathway.

Worthy of note is the self-organised niche BiciLasCondes, which remained a single *comunal* scheme. Due to competitive organisational practices in bike-sharing and disputes between those service operators, this self-organised system could not be incorporated with the BikeSantiago scheme. Findings also revealed that the first inter-*comunal* BSS was implemented via a PSI scheme as an individual private scheme without any active state involvement, as Chapter 7 showed. Equally, the BSS was deployed as a 'mobility cause' by the transnational financial sponsor; therefore, this

financial institution is in fact the lender-owner of the system, under a voluntary state rationale. These results are consistent with a type of philanthro-capitalism practice with a predefined cause in mobility (Chapter 4) being novel with respect to a mobility justice and transition research.

A second discussion provides links between the institutional and operational levels, focusing on the consequence of the rules, agreements and practices to deploy the BSS BikeSantiago. Links in rules refers to the decision over the regulatory conditions under which the BSS could be deployed in Santiago. Findings suggest that the deployment was done via a collaborative strategy based on flexible contracts 'less highly specific' to accommodate a corporate sustainability practice (the PSI scheme, for details, see Chapter 4), requiring a de-regulated context for its introduction. Here, the scheme led by Itaú Unibanco Holding S.A exerted pressure from the landscape level, re-organising the sub-national governance regime in Santiago.

From an institutional point of view, findings from both early decisions and in the public tendering indicate that flexible contracts also relate to a strategy of 'defection' (see Chapter 3) as the best alternative to effectively achieve a unified BSS in Santiago. As introduced previously, a strategy of 'defection' refers in this research to the free concession contracts, as the public tendering showed. While this strategy was present in the regional study aiming at increasing the profit formula, the analysis in Chapter 7 showed that this was the only alternative to achieve an inter-*comunal* system due to a branding restriction that the sponsor faced in deploying the BSS BikeSantiago.

As with the links in rules, links in practices relate to all those practices that made possible the BSS in Santiago. Chapters 7 and 8 showed that the network agreed in the public tendering presented critical conjunctures due to relational problems derived from the partnership design at the niche-level. These conjunctures were noticed in the organisational dilemmas and particularly regarding motivational and informational issues that culminated in being decisive in the distribution and perception of benefits. Indeed, results indicated that the flexible agreements influenced the operational levels in a more 'self-interested way'. This evidence also expresses a mismatch between the high-level goals agreed and the system performance. In this regard, self-organised practices conducted by the operator, such as control demand and informational problems, indicating difficulties in reaching the agreed objectives, leaving room for doubt about opportunistic behaviour when the service operator faced unexpected and unresolved issues in the first year of

operation. This finding also reveals a rationality of an abstentionist state, and an absence of effective mediating bodies between civil society and institutions. This is demonstrated, for example, by the inability to provide a subsidy arguing a lack of trust between the key partners as well as the lack of capacity to address system failures and public values.

In this regard, the financial institution's reputation played a crucial role as the principal to address the shortcomings; however, its limitations became evident when addressing public values. In addition, results expressed tensions between collaboration due to this partnership design (the niche level) and an 'institutional and organisational vacuum' meaning a lack of recognition of the different capabilities and challenges that each actor faced in Santiago to build a robust relationship on the agreed interests. Indeed, results in Chapter 7 showed that the niche-level faces a key challenge in building up the process of a trust-building partnership towards common purposes, requiring work 'through' effective involvement, participation and deliberation based on transparency and trust (Hrelja et al., 2018). It implies the consideration of relevant features in partnership designs to enhance collaboration over time, face unexpected issues and build more robust and long-term contributions.

Moreover, findings associated with system performance suggest significant challenges on how niche-actors and partnerships are envisioned, recognised and relate in practice. Difficulties in sustaining commitment in a philanthropic-oriented practice also relate to poor incentives between the key partners to continue the collaboration. In a more relational perspective, this discussion implies that contracts should be seen as 'less highly specific and more reliant on process' (Hrelja et al., 2018:329). Flexibility in contracts entails a potential process of openness and learning to sustain commitment over time, stressing the need to work on common interests towards cohesion and avoiding working in an 'institutional and organisational vacuum', as seen in the operator's difficulties in the first year of deployment. However, results in Chapter 7 also indicate that the agreements were based on nested identity as a sub-national common value. Therefore, transformative urban and institutional practices were expressed by the key partners, suggesting a sign of a transition pathway towards a more inclusive deployment. However, it also stressed the need to understand that a fundamental component of a mobility justice transition is relational in nature, where public and private values must be constantly aligned.

8.3.5 The Operational Level

System performance analysis of the BSS BikeSantiago examined current travel patterns, service levels and perceptions of benefits in order to understand the relationships between planning tools, agreements made and operational levels in both fostering and hindering more equal and inclusive mobility landscapes.

This analysis showed the significance of maintenance in the level of adoption, usage and perception of benefits, which is shaped by previous decision-making stages when looking at the agreements and decisions previously made regarding the signatory parties, their capabilities and what was agreed. These results suggest that not only the spatial availability of the service is sufficient to ensure its use and adoption, but also maintenance is strongly influenced by the characteristics of the partners and the partnership design. The novelty of this evidence in bike-sharing relates to the previous institutional and organisational settings in decision-making, a social cause without a state intervention that took shape in Santiago. In understanding maintenance, two supply chain management factors were found describing the BSS performance: a) a strategic bicycle distribution circuit and b) increased bicycle supply at strategic bicycle docking stations during peak hours.

Despite its positive effects in the short-term to manage the BSS BikeSantiago, findings in Chapter 8 (phase I) expressed the lack of a clearly defined framework of system management, deviating from the original common purpose of having this system in all 14 *comunas.* Findings on the operational levels showed a pattern of self-organised practice from a key partner who decides to unilaterally set up a demand control. These results showed that the collaborative agreements could not be achieved in practice, as a reduction of service levels was found affecting remote and less busy docking stations in terms of accessibility, equality and social inclusiveness, especially in deprived areas in Santiago. These findings are significant, considering the inter-governmental agreement and the Private Social Investment purpose in providing an effective access to a safe, affordable, and sustainable novel means of transport system in Santiago. These results are consistent with a 'voluntary state' rationale, as the PSI scheme led to, in practice, more "market opportunities rather than as political questions" (Nickel and Eikenberry 2013:2). Indeed, the maintenance of BikeSantiago evidenced logistical mechanisms that was influential in reproducing the social, environmental and economic inequalities in Santiago and that, to some degree, the niche-level was supposed to challenge.

Regarding problems with system performance and the impossibility for public institutions to have real-time information from the system, the construction of the alluvial diagrams and the circular dendrogram allowed illustrating this issue. This data visualisation showed the inter-*comunal* and multi-modal character of this BSS by providing the 'big picture' of the travel patterns not only in the strategic *comunas* where the fleet management strategy was found (i.e. the first-tier), but also allowed an understanding of the second-tier group of *comunas,* which are crucial components for the inter-*comunal* success of this BSS. The identification of the second tier *comunas* provided significant information on the actual system capacity in its first year of implementation, as current BSS users not only were residents of the 14 participating *comunas*, but also provided a regional view on the activities of the people using the system.

To understand the operational levels (macro-level) it was essential to examine the experiences of current users as a key factor for a mobility justice transition pathway. This was particularly relevant when carrying out the survey, as I perceived a high motivation of respondents to express their opinion and share their experiences. Thus, findings on low service level, i.e. bicycle returns, data errors and electronic payment problems, were found to be interrelated, which allowed to expand the relationship between planning tools, agreements made, and the operational levels. These findings were mainly corroborated by giving voice to the BSS travellers, which in turn they relate to the low levels of 'customer service communication', aggravated by the institutional context in Santiago, where public institutions could not actively participate in the operation of the system nor address public values (Chapter 7).

In connection with low service level results, it is relevant to discuss the findings of card payment problems through the lens of mobility justice as it raised significant concerns to data management and protection, especially at peak hours at 'lung' locations and at poorly maintained stations. In this regard, these results lead to red flags about exposing people to negative side effects derived from experimental technological deployments and de-regulated 'enabling environments', in the absence of clear legal and regulatory frameworks. These findings suggest a critical institutional and organisational juncture as a matter of social justice, requiring addressing at earlier decision-making processes, possible risks or abusive practices and thus to address public values as a priority, in the light of this unexpected outcome. The debate in this regard has just emerged, posing the challenge not only to provide access to such systems but also requiring ensure sufficient quality for safety reasons.

Despite the negative side effects of the results from the perception of benefits, they are, in general, favourable, allowing approaching the objective of becoming a real transport alternative. Likewise, it is important to stress the health and wellbeing benefits of BSS perceived. However, a remaining challenge is to ensure that such benefits also meet the different socio-spatial transport needs as a matter of equal concerns and, therefore, being able to treat the different *comunas* as equals.

To conclude, it is possible to state with these results that the first inter-*comunal* BSS in Santiago is a contested niche-innovation in transport due to its decision-making process of deployment and the subsequence social outcomes here described. Worthy of note is the BSS operator replacement at the end of 2018, in light of a civil lawsuit due to widespread operational difficulties that became unsustainable over time, and which are beyond the scope of the analysis of this thesis. This replacement aimed at improving the initial system performance conditions described in Chapter 8. Nonetheless, the BSS challenged the governance regime as a niche-innovation, moving away from multiple and isolated decision-making silos to one with a complex but unified system at the regional level. As such, this empirical analysis highlighted the common challenges and uncertainties that niche-innovations may face.

Changes do not happen in a vacuum. This thesis created a recognition of the set of rules that must be considered to trigger processes of change. Considering for example the case of extra charges to users, the Chilean state must update the protection of personal data as the European states have done with respect to such protection. This argument also points to the role of the state assumed in this deployment, having to address the public values of access, equality and safety.

Chapter 9. Conclusions

This thesis has sought to contribute to current research efforts about socio-technical transitions and mobility justice. In this sense, this thesis analysed the role of decision-making processes comprised in the deployment of niche-innovation in triggering transformative adaptations towards mobility justice transition by placing the focus on the early stages of a technological niche-deployment to analyse the internal congruence of its transition trajectory. Here it is argued that significant insights can be obtained in the relational dynamics between the institutional and operational levels to understand the character of the transition towards more inclusive and equal transport landscapes, examining possible alternatives for these purposes.

The research objective had a twofold purpose. On the one hand, literature on mobility justice (Chapter 3) stresses the need to focus on 'distributional' dimensions since critiques about transition studies very much focus on 'provisioning' dimensions, neglecting distributional aspects. This critique leads to analysing path-dependence that tends to perpetuate inequalities, and therefore, leads to unsustainable and unequal socio-technical systems. On the other hand, this thesis was motivated by the role of inter-governmental collaboration in addressing issues of distribution and equity at the sub-national levels of governance, exploring the rationale behind unequal socio-spatial patterns in regional development. This draws on the New Institutional Economics (NIE) framework and a set of analytical bodies of theories brought together for this purpose (Chapter 4).

The notion of self-organised practices (Ostrom, 1983) was crucial to reveal segregated and unequal socio-spatial metropolitan patterns linked to the concept of stratification, in the understanding that any system operates on the basis of perceptions of status, such as class, gender, race/ethnicity. The notion of self-organised practices as applied to territorial units highlighting critical differences among the subnational units to address distributional issues is a matter of public values in mobility justice. This perspective provided relevant insights into the mobility justice framework, allowing placing the focus on the differences in the capabilities of institutions, travel needs and challenges that each niche-actor faces, for example, institutions, organisations and civil society. Achieving the overarching research objective was also possible by incorporating a relational perspective, showing existent mismatches between capabilities, power and values over shared resources that indeed lead to disputes about resource distribution.

Engagement with the literature on corporate sustainability and the philanthrocapitalism framework offered an entry point into tensions, synergies and complexities in an environment of competing social and environmental needs and profitability such as that found in Santiago's BSS. This helped reveal the simultaneous patterns of inertia and change in a given trajectory of transition, here addressed in relation to organizational paradoxes. The corporate sustainability and philanthro-capitalism literature also contributed with a broader perspective to understanding relational issues resulting from agreements made. These are currently exploring innovations in mobility by highlighting institutional, organisational and operative levels, in particular in an attempt to address inclusive objectives. Paradoxes in organisation contributed significantly to a relational vision of the first inter-*comunal* BSS deployment in Santiago.

Another important contribution to the research comes in the literature on contracts. As the relational perspective focused on significant relationship-building processes, it enabled a 'big picture' of the institutional and organisational landscape. This perspective made it possible to shift the focus of BSS deployment from problem-solving to building partnership processes, stressing that differences in decision-making capabilities can be crucial in hindering or fostering issues in moving towards more cohesive operational scenarios. Therefore, by aligning high-level objectives to fulfil the agreements through processes of transparency, trust and deliberation comprised in a niche-deployment, it is possible to conclude that a mobility justice transition is also a relational issue.

9.1 Addressing the research question

This final chapter summarises key findings and returns to the original research question.

To remind the reader, the central question here posed asked:

How might a niche-innovation in transport lead to a mobility justice transition, considering the first inter-*comunal* BSS in Santiago, Chile in the period 2011-2017 as a case study?

In order to address this research question, the thesis sought to analyse the role of decision-making processes in triggering transformative adaptations that account for

a mobility justice transition towards more equitable and inclusive mobility landscapes, considering the case of the first inter-*comunal* BSS in Santiago.

In this regard, three key sub-objectives helped to build an answer:

i) To understand the institutional rationale behind the BSS regional business model as a planning tool to deploy the first *inter-comunal* BSS in Santiago in order to analyse its role in triggering a mobility justice transition.

ii) To provide linkages between institutional and operational levels to deploy the BSS in Santiago, highlighting the role of inter-governmental agreements in fostering or hindering the reproduction of inequalities.

iii) To analyse the performance of BSS BikeSantiago considering the first year of its full operation in the 14 *comunas* in order to understand the relationships between planning tools, agreements made and the operational level in both fostering or hindering more equal and inclusive mobility landscapes.

To address the first research sub-objective, this research drew on insights in the literature from transition studies, business model innovation, and bicycle sharing systems, as in Figures 1.1 and 1.2 (see Chapter 1). Key findings on early decision-making analysis showed a particular rationale in the niche-level design process, where the regional business model and the construction of values comprised there were, in part, the planning tool to guide the potential decision-making process for the BSS deployment. This planning mechanism comprised those initial alignments at the sub-national level, envisaging a particular institutional-organisational dynamic. The role of the regional business model relied on two premises. While it expressed intentions to replicate a *dominant industry recipe,* it also showed an incipient transformative institutional adaptation as a *subject of innovation,* challenging existing centralised top-down- policies and local self-organised practices.

However, the rationale of the original proposal had significant biases based on the ideas of opening markets to replicate an industrial formula in BSS, disregarding potential negative effects about the reproduction of socio-spatial inequalities that the literature on bike-sharing has stressed. Through these results, such a planning mechanism proved to be limited to deal with a complex metropolitan-wide deployment process. Crucial challenges from these findings in the early stages of decision-

making related to how to address public value through integrative strategies in a niche-deployment in transport. Here, it was also recognised the horizontal differences in the metropolitan context in Santiago, yet vertically integrated with such niche-deployment.

Regarding the sub-objective ii) it may further be said that inter-governmental agreements and collaborative actions are crucial to challenging patterns of socio-spatial inequality such as those seen in Greater Santiago. Indeed, results in Chapter 7 offered an understanding of simultaneous patterns of self-organisation and collaboration challenging the novel governance dynamic between the trans-national and the sub-national levels to implement the BSS in Santiago. This approach, combining several theoretical bodies, revealed links between the institutional and operational levels to provide an understanding of the role of decision-making processes in triggering transformative adaptations that account for a mobility justice transition, considering the case of the first inter-*comunal* BSS in Santiago. In this regard, key findings relate to the relational rationale about how partners and partnerships are seen and designed and how they perform in practice. Differences regarding capabilities in conjunction with the institutional setting in decision-making led to isolated or self-organised practices, giving rise to difficulties to sustain the collaboration over time and, therefore, affecting the performance of the system.

Findings also revealed that the first inter-*comunal* BSS was implemented in 14 *comunas* via the Private Social Investment scheme. As the analysis in Chapter 7 showed, it was a highly hybridised pattern of governance in mobility, illustrating an asymmetry of power between a trans-national investment holding and their preference for building key partners with the sub-national governance regarding the degree of autonomy. Thus, this is a shift from the state responsibility as a political matter to a 'voluntary' will of firms. As a result, the system was deployed through a philanthro-capitalism action, or a 'mobility cause' as a practice in corporate sustainability, and a 'voluntary state' rationale, revealing a marked reduction in the size and role of the state in the deployment of the BSS BikeSantiago.

Worthy of note is that collaboration as an inter-governmental arrangement towards social inclusion proved to be a transformative strategy for change, given that Greater Santiago is a metropolitan context with high levels of socio-economic inequality and where decision-making capacity at the sub-national levels was found to be weak. Therefore, the inter-governmental arrangement could be argued pragmatically as the best available option to include more and diverse *comunas*. This statement also

expresses a political action to address such deployment in the attempt to include less advantaged areas; however, it was a weak agreement when examining the operational level of BikeSantiago. At the same time, this collaborative practice also raises critical institutional and social questions regarding the way partners were considered in the partnership design. It is important to highlight here the relevance of the institutional and organisational characteristics relating to values, norms and capabilities within partnership designs in pursuit of common goals.

Indeed, free concession contracts led to a weakening of the sub-national governance regime by depriving those who were included in the collaborative agreement of their decision-making capacity. This was due to the agreement on branding and the restrictions that the financial institution faced territorially to implement BikeSantiago through a PSI scheme, thus revealing certain self-organised practices in local governments as critical institutional and organizational conjunctures. In this regard, this decision was found to be a critical factor that discouraged the initial collaboration, also showing a mismatch between high-level goals agreed in the public tendering and performance activities. In addition, the implementation process showed tensions between collaboration and self-organised practices, recognizing that the inter-governmental agreement was made in a 'institutional and organisational vacuum', disregarding differences in capabilities and challenges that each actor faced to sustain commitments over time.

However, these findings are significant for institutional analysis research as they allow the focus to be placed on the design and construction of robust, flexible and sustainable partnerships. Here, capabilities, institutional setting and knowledge were found to be key partner features but more relevant was to understand that common interests, shared experiences, and values that bound them together were crucial to face unexpected issues. Collaboration and flexible arrangements posed a challenge regarding the need for a new relational perspective on emerging mobility contracts as "less highly specific and more reliant on process" (Hrelja et al., 2018:329), particularly in contexts where a single authority managing an emerging mobility deployment may not be sufficient to address organisational complexities in practice.

These observations about collaborative practices also suggest a need to focus on the time horizon of an intervention. The BSS seemed to be a problem-solving intervention accommodating an industry recipe while seeking to build trust-partnerships and yet seemed unable to face the real social challenges that such a deployment entail. Distributive concerns discussed in this thesis, through the lens of the NIE framework,

suggest working ‘through’ tensions and synergies to sustain collaboration and build cohesion. Therefore, a mobility justice transition was found to be a relational matter between key partners, namely the public sector, private sector and civil society. The discussion posed here involves understanding who and how key partners are recognised and embedded in a particular partnership design.

In approaching the sub-objective iii) it may be stated that the success of a transition pathway towards mobility justice is a constant institutional and organizational interaction that requires mediation on the basis of inclusion and deliberation processes. The analysis of the operational levels showed that system performance and maintenance are significant at the level of adoption, usage and perception of benefits, which are shaped by the different decision-making stages. At the operational levels, findings showed the lack of a clear framework of planning and management and a misalignment with initial high-level objectives in terms of effectively achieving the agreements for 14 *comunas* in Santiago. Here, a pattern of self-organised logistical practices from a key partner, who decides to unilaterally set up a strategy for controlling demand, reduced service level and therefore, affected the more remote and less busy docking stations, in particular in socio-economically deprived areas. Thus, the distributional sphere of BikeSantiago was not only a spatial matter but also a matter of a partnership design, where such mechanisms of control can also be influential in reproducing the social, environmental and economic inequalities.

Motivational and informational issues observed in the system performance, in conjunction with the public institutional governance context, revealed another crucial factor that discourages collaboration. Indeed, a complete disconnection between the different parties involved (private and public institutions, organisations and civil society) was found during the fieldwork, enabling self-organised practices at operational levels with unequal and unfair consequences, especially regarding the user’s data management and the extra charges reported. This fact is evidenced by observing that information regarding the operation was found to be in the power only of the service operator, and even though I had access to the system’s database, information about system performance was a contested matter. Indeed, people's travel and billing problems were very sensitive issues, and the operator already had a lawsuit in progress in this regard at the time of the fieldwork. It was therefore decided to create my own mechanisms for analysing the operational level. Hence, the construction of the alluvial diagrams and the circular dendrogram were crucial

tools to illustrate the ‘big picture’ of the system’s performance, thus showing travel patterns, service level and the perception of benefits.

Through these data visualisation tools, it became possible to understand the fleet management strategy (i.e. the first tier or the busiest *comunas),* in addition to the second-tier group of *comunas* as the most remote and unattended locations. An understanding and mapping of second-tier *comunas* offered significant information on the actual system capacity in its first year of implementation, showing that current BSS travellers not only were residents of the 14 participating *comunas,* but instead providing a regional view of the system performance in the metropolitan context of Santiago.

Results of the perception of benefits were, in general, favourable, and the system was perceived as needed, partly resulting from the negative experiences associated with formal public transport as well as the distances and travel time that people in Santiago face to carry out their daily activities. Therefore, highlighted here are the health and accessibility benefits perceived. A remaining challenge is to ensure that such benefits also meet the different socio-spatial transport needs as a matter of equal concern.

Based on this synthesis of ideas, the research question of this thesis can be answered as follows: A niche-innovation in transport can trigger transformative processes towards fairer and more inclusive transport landscapes by challenging segregationist logics with collaborative actions as signs of change. This is possible by understanding their deployment process through the lens of decision-making. This helps to reveal the underlying rationale expressed in the set of rules, capabilities, alignments as well as how partners are seen and agree a partnership. Thus, as perceived in this case study, an initial step is to build an understanding of the institutional and governance setting. Changes do not happen in a vacuum, thus the recognition of the set of rules must be considered to trigger processes of changes. Likewise, partnerships supporting niche-innovations operate within norms, values and practices, which are socially and culturally conditioned, and in turn, are systematically shaped by the actions of society. Unfolding the rationale in decision-making and ‘working through’ tensions and synergies towards common interests, on the basis of transparency, collaboration, trust and deliberation, a mobility justice transition pathway can be created.

9.2 Research contributions

The present research has made three types of contributions: theoretical, methodological and empirical contributions.

The first form of a contribution is to the literature in transition and mobility justice. This was possible by selecting elements of the NIE framework applied. This study focused on Santiago as a large city in South America, but findings are of wider interest, especially in Global South cities. This thesis examined the process of a BSS deployment and the decision-making scenario underpinning it, highlighting the main challenges faced by the institutions in doing so. By bringing insights from a mobility justice framework and the particular focus on NIE, this thesis was able to theoretically contribute with a Socio-Technical Transition perspective, specifically through the lens of the Multi-Level Perspective as a theory process applied. Essentially, this thesis reconceptualised the niche-regime-landscape dynamic as a multi-directional relationship in decision-making, both horizontal (the sub-national level) and vertical (the trans-national level) to settle the analysis of the deployment process of the first inter-*comunal* BSS in Santiago, a metropolitan context of high spatial and socio-economic inequalities.

The relevance of the NIE framework in a Multi-Level Perspective relates to three key dimensions: i) rules and norms embedded in an institution ii) institutions and organisations operating both in economic and institutional environments or settings and iii) the organisational 'arena' that comprises a given dynamic interaction, where actors experience tensions and complexities in the process of adaptation to institutions while strategically influencing them.

MLP and transition framework contributed to this research by providing a simplified way of approaching a complex non-linear phenomenon, understanding that a transition is a complex process of constant change, stability and adaptations. In transition research, the concept of the regime has been extensively studied from the set of rules perspective. However, this research contributes to transition theories by highlighting the role of institutions and organisations in decision-making and making explicit the focus of the distributive perspective as a relational matter in mobility justice, through an understanding of the rationale comprised in the values, rules, and practices applied. In this regard, it was possible to set a discussion not only on concerns about the failures of an 'enabling state' as Chile is usually characterised, but also about the 'enabling environment' that took place as an issue 'around the

state' regarding the focus of finance and the formalisation of these emerging mobility markets via a PSI scheme. This perspective gave room to a better discussion about the increasing governance hybridity in such technological deployments, making us recognise that the balance of power seems to be shifting to a more hybrid and trans-national governance type, exemplified by the application of the philanthro-capitalism BSS deployment. Thus, this is also a philosophical discussion that places the focus on answering to which society we aspire, and the relevance of treating the institutions and individuals as equal. This means considering different capabilities and settings that influence the decision-making capabilities, particularly in weak institutional contexts such Santiago's poorer *comunas.*

In addition, BSS analysis and MLP have been largely used in the context of developed countries, extensively focusing on critical transition studies towards sustainable transport futures; however, social challenges in the Global South have been less explored from these angles. While recognising the urgency of de-carbonisation concerns, this study criticises the rules and enforcement of rules considering that states have been restructured in order to minimise a direct intervention under the rationale on competitive practices and regulatory frameworks reframed to support entrepreneurial activities, as the regional business model analysis showed.

Urban transport inequalities and new technological deployments require an explicit and accurate analytical focus, addressed here from the donor-driven approach, particularly challenging in terms of institutional and organisational *conjunctures* in the context of the Global South. Thus, the MLP, mobility justice and the NIE perspective helped to provide a novel approach to visualise the main concerns of both state and market failure, which is exacerbated in such contexts.

Empirical contributions are highly relevant in light of these data. On the one hand, this thesis carried out a Multi-Level Perspective on a recent process of technological deployment in transport towards more utility cycling in Santiago, as described in Chapter 5. Beyond the focus on cycling, this thesis has sought to also present a niche-innovation promoting cycling, broadly as a mobility justice concern embedded in a multi-level governance dynamic. Thus, this thesis was able to articulate an accurate vision regarding the role of instruments, individuals, organisations and institutions to set up the analysis scene and answer the research question, considering a highly unequal metropolitan context. Thus, it was possible to raise the concerns of each key partner, the partnership design and setting as well as the

perceived benefits associated with the BSS deployment at the same time. In doing so, this thesis interviewed a broad range of stakeholders involved in the deployment at each stage of the process, introducing a holistic perspective on the path-dependency and change, in particular to the approaches taken to deploy a system in 14 *comunas* and the rationale comprised in their values, rules and practice.

Thus, this thesis contributes to the inter-governance collaboration debate through a novel perspective to approach it, and therefore, being able to discuss how an 'enabling environments' is built, from an institutional and organisational perspective, and thus to reflect on robust building trust-partnership processes. It implied shifting the focus on visualizing emerging mobilities as a short-term and problem-solving matter towards more relational processes. Therefore, this perspective allowed giving rise to tensions and synergies in collaboration and self-organised practices that challenged the reproduction of inequalities in Santiago. Thus, this analytical approach guided the analysis of agreements towards more reflective scenarios of inertia and change. This perspective, therefore, stressed the need to explore different relational forms to address social needs in context when a state does not have sufficient capacity to address public values. Hence, the philanthropic approach became a relevant analytical framework, taking into account the hybrid forms of governance we face nowadays. Thus, to address the research question, this thesis posed a 'paradox perspective' to address an approach of change rather than a contested vision. In fact, the territorial approach presented here is a contribution to the paradox theory by integrating the vision of collaboration and self-organisation to explain the mechanism that reproduces and challenges the socio-spatial inequalities and work through tensions and synergies in environments of competing social and environmental needs and profitability, considering the emerging mobility landscape. Such a perspective seems timely also due to COVID-19 and austerity challenges. The emerging mobility party is only just getting started and urges both scholars and practitioners to rethink the needs and meanings of transport regarding the urban, institutional and social challenges we are facing, where collaboration and collaborative actions are crucial.

Methodological contributions lie on the mix-method design and analysis as it allows conducting a comprehensive analysis over the phenomenon in focus, being able to combine and integrate different sources of data and key visualisation methods to answer the research question posed. Thus, this thesis addressed the distributive dimensions supported by this mixed-method approach. Furthermore, by developing

key observational mechanisms as well as data visualisation and management techniques to both data collection and analysis, this thesis provided an explicit methodological contribution in mixed methods, highlighting that these mechanisms came from motivational and informational problems. Therefore, these issues contributed to answering the research question from a methodological perspective. Thus, it could be stated that the self-organised practices comprised in the decision-making within the institutional and organisational arena influenced the reproduction of inequalities considering the BSS deployment in Santiago as a case study. In this regard, the methodological contribution highlighted here relates to the key informational and data management issues as a matter of methodological design. It allowed shedding light on BSS management problems in relation to travel data records and personal data associated with credit cards, where the operational system appeared weak and easily corrupted. In light of these key operational insights, it is also possible to argue that this primary data also helped to identify a control group to support future research, even while this research pursued descriptive purposes and raised significant operational conflicts.

Alongside the institutional and the decision-making challenges of BSS deployment, the use of data visualisation tools stressing the operational and logistical challenges constitutes another contribution. Indeed, even the Sankey diagrams have been used in the literature to illustrate travel patterns (Oliveira et al., 2016; Shi et al., 2018; Vogel et al., 2014; Yan et al., 2018; Zhou, 2015). The contribution here is to have positioned the *comunas* as a unit of analysis in travel patterns terms. Dendrograms and alluvial diagrams used in this thesis contribute to the understanding of the BSS operational management between higher (first tier) and lower (second tier) *comunas.* The analysis and visualisation through these diagrams made it possible to quickly compare the performance of the operation (quality and quantity distributed) across *comunas.* This novel visualisation accounts for the principles required to visualise an operational level on an emerging mobility scheme, considering a fragmented metropolitan context facing motivational and informational problems.

In conclusion, it is important to note that the conceptualisation here developed was here understood as a transformative adaptation, or adaptive strategy aiming at both triggering changes and simultaneously creating/accommodating alternative systems to depart from unequal and dominant mobility regimes towards a more equal and inclusive mobility landscape. This suggestive conceptualisation through the lens of the Multi-Level Perspective was refined during the course of this research,

highlighting the interlinked social and technological role to conduct a mobility justice transition research and to bring about more equal and inclusive transport landscapes. In particular, having answered the research question by clearly drawing attention to existing and dominant self-organised practices which are deeply socially embedded, nevertheless, it was aggravated by the 'artefactual' perspective on technologies.

To sum up, for building a mobility justice transition pathway, it is crucial to have elements and strategies in place that reinforce and maintain collaboration towards cohesion while contributing to reducing institutional and social biases. Likewise, in light of the theoretical and empirical approach, addressing the real societal challenges that mobility poses imply a relational matter, requiring a critical perspective over values, rules and practices that these technologies embody. This enables the conduct of activities that are significant for people, taking into account their differences in needs, capabilities, beliefs and settings that they deserve as everybody deserves to be treated as equal.

9.3 Limitations and future research

Common weaknesses and limitations due to a single case study define the first limitation. In this regard, a cross-sectional user survey across diverse cities or contexts would be beneficial, in addition to analysing and comparing the links between the institutional and operational levels in decision-making, and being able to determine the differences that foster or constrain both social and sustainability policies successfully. For example, the deployment of autonomous vehicles is a highly complex process that requires holistic multi-level views. From a sub-national research perspective, it would certainly be helpful to apply a survey to the whole BSS network and cross it with the database to highlight those perceptual aspects of the operation. This research explicitly critiques the generalised approach of the technological deployments and in particular, to the bike-sharing literature, which makes it difficult to analyse the perception of the benefits.

A theoretical limitation is the application of MLP on a single case study in a short-period of time. It would be valuable and insightful to contrast several case studies over a longer period of time under this theoretical and analytical approach. However, this thesis contributes with the approach and the necessary elements to be able to adequately conduct a comparative work, taking into account the complexity of the

decision-making scenarios, mix-methods and therefore, the point of comparison. It would also be interesting to review the application of MLP and its common criticisms regarding the distributive dimensions (Geels, 2019). A longer analysis could allow identifying the pattern of social and sustainable transformations and may take into account the particularities of different contexts (Shove and Walker, 2010). Equally, it is highly relevant to work with sub-national research and MLP to compare different governance styles and to discuss their decision-making challenges, expanding the notion of fragmented metropolitan settings to different governance settings.

In line with contemporary debates, participatory processes of technological niche deployment require an explicit social justice framework to address issues in participation and deliberation, which also constitutes a limitation of this research as it requires a more interventionalist approach. Participatory Action Research methods, in conjunction with collaborative learning processes between different institutions, organisations and civil society, as well as grassroots and bottom-up innovations (Nixon and Schwanen, 2018) in emerging mobility deployments, are all future studies that strengthen a more integrative social justice perspective. This in turn is particularly relevant in drawing attention to the challenges faced by the philanthropic context, which needs to be supported with a holistic institutional perspective, which is also a future study envisaged.

Given the sub-national issues and the nature of the resources raised with their branding constraints, the need arises here to rethink how 'enabling environments', and partnership design are built to address public values, assuming increasing hybridity of governance, as seen through BikeSantiago. While it is important to explore flexible and novel tools of planning which are more reliant on processes, current societal and governance challenges require novel social and institutional approaches and thus, avoiding working separately with social and institutional complexities in mobility justice (Mullen et al., 2014; Backhaus et al., 2019; Signor et al., 2019). In other words, this is a concern when contrasting accessibility objectives and equity principles with policy-making priorities and capabilities (Clark and Curl, 2016; Hickman et al., 2020; Nikitas, 2019; Pajarito et al., 2018; Thomopoulos and Grant-Muller, 2013; Thomopoulos and Nikitas, 2019).

Since the data visualisation of BSS constitutes a contribution to the literature of bike-sharing, operational arenas require innovative tools to further interact with institutional levels, in a dynamic dialogue for emerging niches and data management, particularly in a context where different niches co-exist. For example, the service

provider Serco and Transport for London (TfL) have a public-private alliance to maintain a high level of availability of Santander Bikes. Thus, data visualisation dynamically integrated with the institutional and operational levels could lead to a more efficient, equitable, and ethical distribution of a niche, and thus addressing its public values.

> ... the only thing that actually works is not ideological, it is impure, has elements of both arguments and never actually achieves any kind of partisan or philosophical perfection. It's pragmatic, it includes the best aspects of socialistic thought and of free market capitalism and it works because we don't let it work entirely ... (David Simon, The Observer, Sunday 8 December 2013)
>
> http://www.theguardian.com/world/2013/dec/08/david-simon-capitalism-marx-two-americas-wire (accessed 11/03/18)

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APPENDIX A.1 Survey template

My name is Veronica Saud, PhD student at the University College London (UCL).
We are studying the social effects derived from the implementation of BikeSantiago, in order to contribute to a better and more inclusive provision. The question pattern relates to your experience using the current public bicycle system. The response time takes around 7 minutes. Thank you very much for your participation. Please sign at the end.

N°_____ Station: _____ Hour: _____ Date: _____

I. Identification Data

1. **Age:** _____ /**2. Gender**: F____ M ____ Other____ /**3. Place of birth** 1-Chilean ____ 2- Foreign____

4. **What do you mainly use the public bicycle for?**
   1. Commuting
   2. To move to/from the place where I study
   3. Shopping and personal bussiness
   4. Look after someone (visiting or carrying)
   5. As a means of work, for example, distributing something using the bicycle
   6. Fitness and Leisure
   7. OTHER _____

5. **¿ What is your main occupation or activity at the moment?**
   1. Employer
   2. Own Business
   3. Employee
   4. Army
   5. Student
   6. Unemployed
   7. OTHER _____

6. **What is the highest level of education you have reached (years)?**
   1. 12 years
   2. 16 years
   3. 18 years

4. ***Comuna* of residence today** _____
5. ***Comuna* where you develop your occupation** _____
6. **What means of transport did you use before a public bicycle for the same trip?**
   1.- Walking____ 2. Public Transport (bus / metro)___ 3. Car____ 4. Private bicycle____ 5. Taxi/uber ____ 6. Moto____

7. **How long have you been using the Public Bicycle System? (months)**
   1. ____ 0 to 6 months; /2. ____7 months to 1 years: /3. ____ 13 months to 1.5 years; /4. ____+ 1.5 years

8. **How often do you normally use the Bicycle Sharing System?**
   1. Once a month
   2. Every two weeks
   3. Once a week
   4. 2 to 3 times per week
   5. More than 3 times a week

9. **In the last 30 days, how many trips did you actually make on a public bicycle? (considering as a trip, the collection and return of a bicycle) N** _____

10. **In the last 30 days, how often in % were you able to make the trips you had planned to make by a public bike?**
    1. I made all the usual trips I had planned on a public bicycle (100%)
    2. I made almost all the usual trips I had planned on a public bicycle (75%)
    3. I made some of the usual trips I had planned on a public bicycle (50% o menos)
    4. I could not make any trip in the last 30 days

11. **When you use a public bicycle for your frequent trip by BSS, do you combine with other means of transport?**
    1. I combine between a public bike and public transport (metro, bus or other).
    2. I combine between a public bike and taxi / uber
    3. I combine between a public bike and car
    4. I combine between a public bike and walking (considering walking as more than 3 blocks for collecting/returning a public bike)
    5. I only use a public bike
    6. Other combination _____

12. **Do you use the mobile application (APP) of the system or online information for regular trips? 1.Yes___ 2.No___**

13. **¿ How many blocks do you walk to collect a public bicycle and start a regular trip? N___**

14. **Considering your experience using public bicycles and the means of transport you used before, what do you notice about the following benefits of using a public bicycle? (please rate between 1 to 7, 1 totally disagree and 7 for totally agree):**

    1. ____ I'm saving time
    2. ____ I'm saving money
    3. ____ I'm experiencing a better mood and/or better health conditions

15. **If for some reason the public bicycle system disappears, what would be the immediate consequence that you would perceive in your routine? (from 1 as strongly disagree to 7 as strongly agree):**

    1. ____ My health/mood would be affected _____
    2. ____ I couldn't save that much time and I can't manage my time as I do now either.
    3. ____ I couldn't save that amount of money as I do now.
    4. ____ I couldn't make regular trips as easily as I do now.
    5. ____ I couldn't do the same amount of activities as I do now.
    6. ____ I could not travel to places more distant or difficult to reach as I do now.
    7. OTHER CONSEQUENCE _____

16. **Please think of a regular trip and note the following aspects of the current system performance according to your experience (from 1 as very bad to 7 as excellent):**

    1. ____ Available Information on how the system works and information about making trips
    2. ____ Customer service communication
    3. ____ E-payment system
    4. ____ Price according to quality of service and previous means of transport
    5. ____ System coverage for common trips
    6. ____ Public bikes availability for common trips
    7. ____ Dock stations availability for common trips
    8. ____ Public bikes maintenance for common trips
    9. ____ Dock stations maintenance
    10. ____ Satisfaction Infrastructure level for common trips
    11. ____ Accessibility level in reaching most frequent activities in comparison to your prior experience, before using a public bike.

17. **Have you had any problems using the system? Please let us know those that have made it difficult or impossible for you to make a regular trip by the BSS, or the one that has caused you the most discomfort. Please indicate the main problem(s).**

    1. _____ E-payment errors
    2. _____ Data Collection Errors
    3. _____ Costumer service communication errors
    4. _____ Bicycles in bad conditions
    5. _____ Stations in bad conditions

    6. Other:_____
    _
    7. _____ No failures

18. **How often are you experiencing the main problem you reported in the previous question?**

1.- Generally (or almost always) _____; 2-. Frequently ____; 3- Occasionally ____; 4- Never ____

19. **How easily, from 1 to 7, has that problem been solved? (1 very difficult - 7 very easy)**
    _____

20. **What is the most frequent station where you collect a public bicycle?**
    _____

21. **What is the most frequent station where you return a public bicycle?**
    _____

22. **How would you classify the socioeconomic level of your household, according to the following list?**

    1. _____ High (+$1.2 mill)
    2. _____ Medium – High ($690.000 – $1.200.000)
    3. _____ Medium – Low ($330.000 – $680.000)
    4. _____ Low ($180.000 – $330.000)

Opinion questions related to the purpose of this study.
could we give you a brief interview about some aspects of your experience using the system and record this conversation? Yes/No.

How has your experience with the system been regarding the benefits and advantages of performing your routine over the other way you used or would use? What is your opinion regarding how your personal data is recorded and used for the operation of the system? What would be your recommendations for a better system, close to your needs?
Could we contact you for a participant observation about your usual trip on a public bicycle?

Signature / initials

APPENDIX – A.2 Semi-structured expert interviews template

Introduction

This interview aims to know your opinion as a relevant actor involved in the BSS BikeSantiago deployment. Through this interview, this research seeks to know your vision regarding the required conditions (political and technical) to deploy a new urban transport service to improving current conditions that different groups of people are facing for achieving daily activities and routines.
Three aspects relate to the present interview: your relationship with the current BSS, your vision on how the provision of the public bicycle system has been structured, your opinion related to the social effects that you perceive regarding this new transport service, the way that different actors have been involved, including the previous agreements made, and opportunities, weaknesses and challenges faced to deploy such system. Your consent is required to proceed, please sign below.

Questionnaire

What is or was your relationship with the current *inter-comunal* BSS BikeSatiago in Santiago, Chile?

Part I. Tell us your overarching knowledge and vision about the implementation of the BSS Bikesantiago, in particular:

• The project and operation (e.g. planning, implementation and operation)
• Physical aspects (e.g. planning and investment: location, built environment, infrastructure)
• Main benefits and beneficiaries so far
• Operation and financing (e.g. costs, regulations and incentives)
• Governance challenges (e.g. relations among the various actors, instruments, institutions involved)

Part II. Opinion questions

1. How do you perceive the contribution of the current BSS in the city and between different social groups? Do you have indicators or measurement systems for that purposes?
2. How do you perceive how different actors are involved in the BSS deployment when looking at the various agreements made and the current system performance?
3. What are the social effects that you perceive regarding the BSS implementation and, in particular, regarding the different agreements made between the private and public sector?
4. What are the opportunities, weaknesses, and challenges you perceive when looking at the current deployment of the BSS Bikesantiago?
5. What could be, from your point of view, the required conditions (political and technical/urban, institutional and technological) for a BSS contributing to address the real social challenges improving the conditions in which different groups develop their daily routines?

Thank you very much for your participation.

Appendix B1 Topics of the semi-structured expert interviews

Table B1-1: Data supporting Interpretations of second-order themes. Scheme case and Private Social Investment.
Source: Own elaboration based on Smith, 2014:1602; Stadtler and Wassenhove, 2016:669; Stadtler, 2018:335.

	Representative quotes / First - order codes	Themes / Second - order codes	Aggregation
1	"The bank has two leading roles: one as a sponsor, and one as a creditor. (Bikesantiago) The bank owns it… They are B-Cycle Latam, that's the name of the company (operator); however, 'Bikesantiago' is a brand of the bank… 'The BSS is a cause... one of the important causes of the bank...the bank has four causes in its strategic objectives...its causes are focused on education, sports, culture, and urban mobility... these are from Itaú as a holding, as from the matrix. (The BSS) started in 2011 in Brazil. In 2013, we started in Chile signing of contracts, and in 2014 it was put into action. '... … We are not talking about corporate social responsibility, but about sustainability... it means bringing value to the city, to society, and helping with mobility, with reducing congestion... with faster, friendlier mobility... a company and its environment... its relationship with society must have an additional contribution to its business. In our advertisements, we try to reflect closeness, children, soccer, family, not only Itaú sponsors ...Bikesantiago communicates emotions, closeness...people identify the bank with the bicycles... the oranges ones are the bicycles of Itaú. that is super installed; therefore, it gives you a strong and positive brand presence in the streets, everywhere, and ideally more and more... " (PS1).	Private Social Investment	7.1 Scheme case
2	"ITAU is a sponsor and also a creditor, they (the operator) have a loan with the bank with which they did this business and regarding which (the bank) has a reputation in respect to their brand … people talk about those bicycles as the ITAU bicycles, so they have a great commitment to make this system work…" (LG1)		
3	"The bank provided them with resources in two ways: one, through Corporate Social Responsibility... they have their brand on every bicycle, station, etc. and so they spend a monthly fee ... But they also have a lease contract so that B-Cycle Latam bought from Treck the infrastructure and equipment... so, in the end, the bank lent the money, they bought the things, installed them, and now they have to pay back the loan" (LG2).		
4	"The contribution that the bank makes .... is so strong that it is equivalent to 60% of the annual income of the company .... 40% is equivalent to income through people (membership) and that allows the company to have the necessary income to be able to operate, but here in Chile (the later) it is about 20%" (PR3).		

Table B1-2: Data supporting Interpretations of Second-order themes. Segregation – Socio-Spatial *(comunal)* Segmentation: weak institutions and urban inequalities. Source: Own elaboration based on Smith, 2014:1602; Stadtler and Wassenhove, 2016:669; Stadtler, 2018:335.

	Representative quotes / First - order codes	Themes / Second - order codes	Aggregation
5	"…There was a process of inorganic expansion in which each commune was making its own system, in ... the absence of a strong metropolitan and/or regional structure…" (RG1).	Socio-Spatial *(comunal)* Segmentation: weak institutions and urban inequalities	7.2 Individual and collective tendering type
6	"This is a logic that does not promote *inter-comunalidad*... a logic of [isolated] urban plots" (LG3).		
7	"Segregation is defined in terms of the difference in location of socio-economic groups... available infrastructure tends to be used as a means of attracting high-income groups... where there is a population with the capacity to pay, infrastructure and mixed land use, in general, are concentrated.In general, urban infrastructure tends to be captured by higher socio-economic groups in the city while the most vulnerable groups have less access to urban infrastructure, resulting from the problem of segregation" (E3).		
8	"The journey is not generally analysed as a concept, which is very important. That is why the city is fragmented, and the mobility of people is not linked… in the daily mobility the inequality that we live then the public services, which are badly planned, affecting some group of people… Supposedly, the infrastructure made to connect, bridge, not bring together but divide... There is high complexity in Chile in relation to the infrastructure, the criteria, who executed, how it is done, and how it is evaluated, there is a lack of a territorial vision as the planning assessment is made by land uses… how the flow performs" (E2).		7.2.1 Segregation
	"I see it as a successful project even though it has many problems... due to a lack of planning in the city... the system has been very elitist ... even in *comunas* like Independencia or Recoleta ... coverage in those places is practically non-existent. This elitism responds to the financing structure that it has, finally, it is a private business... it does not respond to a logic... allocating them where they are needed.		
9	... you can see that it is a private project using public goods, apparently, it is subsidised, but it is not clear... they do not have an integrated fare, they are not integrated into the transport system... and I do not know if they are coordinated... in general, having to go and talk to one or another is an indicator of how weak our governance is. This problem has as a consequence the fact that it is not an integrated system, that the coverage is biased by the level of income... without adequate cycling infrastructure... it is a reflection of the thought “we are seeing how it works out” instead of there being planning and coordination among the decision-makers... " (E1).		
10	"...one of the big problems is that there are no guaranteed urban rights’ and ‘mobility should be considered as a public good" (E3).		

Table B1-3: Data supporting Interpretations of second-order themes. Collaboration and nested regional identity.
Source: Own elaboration based on Smith, 2014:1602; Stadtler and Wassenhove, 2016:669; Stadtler, 2018:335.

	Representative quotes / First - order codes	Themes / Second - order codes	Aggregation
11	"Before assuming as the Regional Executive of Santiago, I had a conversation with the mayor of Santiago *comuna* in turn … who raised that one of the problems that the city of Santiago had was this (the territorial fragmentation of local governments and the absence of a robust regional structure)… then I understood that one of my roles - beyond the real attributions or the economic power that we did not have - was to convoke by using the figure of the Regional Executive, who is a figure that symbolically says much more than the capacities and the faculties that he has, to convoke everybody and to promote this agreement… I think that the image and the idea of the city were reinforced by the concept of the BSS and vice versa, the BSS was reinforced by the concept of cooperation between municipalities... We, as representatives of the whole city not as fragments of it, helped the Bike Santiago system to exist... " (RG1).		7.2 Individual and collective tendering type
12	"We were the 'driving force' behind deploying this system, a system - rather than a local system - a regional system. We took steps to make this possible, that is to say, to unify the 14 municipalities and hold a joint tender, in order to provide the system in a common way…" (RG2).	Nested regional identity: a political action, a solidary agreement and a regional sense	
13	"It was my turn as (Santiago *comuna*) to lead the process, in collaboration with Providencia *comuna*, to look at how to implement a system that would go beyond the *comuna* sphere" (LG1).		
14	"We made the first draft of technical bases" (LG3).		
15	"The Santiago Metropolitan Regional Government invited several municipalities to participate in a new initiative' related to implement an alternative means of transport... with the Regional Government and the Municipality of Santiago who carried out the process…" (LG5).		7.2.2 Collaboration
16	"When the current regional executive arrived, he was speaking about the city of Santiago... he had a much more developed concept of the region, from a political point of view…" (RG9).		
17	"The Mayor of Santiago *comuna* asked us to wait for the Regional Executive to arrive and to propose a more extensive bicycle sharing system. Finally, he arrived, and he wanted to extend the system…" (LG1).		
18	"We offered the bicycle sharing system to 4 municipalities to implement at no cost for them. The mayor on duty saw this situation, and with his initial enthusiasm, he called us and told us to implement this new technology, to which we responded that we had planned a system only for 4 municipalities. The commitment was that we would incorporate other *comunas,* with a symbolic number of stations, and the regional government would be in charge of increasing that coverage ... " (PS2).		

Table B1-4: Data supporting Interpretations of second-order themes. Collaboration and nested regional identity.
Source: Own elaboration based on Smith, 2014:1602; Stadtler and Wassenhove, 2016:669; Stadtler, 2018:335.

	Representative quotes / First - order codes	(continuation)
19	"This is the concession of a national good for public use. This solution is unique, there are other similar cases of concessions, which are given when they have social purposes. As the municipalities are the ones that administer the NPG...the most classic in terms of services associated with mobility are (the concessions) of parking lots, but that figure has an associated income. Advertising concessions also have an associated income. This system (of public bicycles) is the only one (concession) without an associated income…" (LG1).	
20	"This 'unique' concession formula was so defined due to the branding restrictions that Santiago and Providencia *comuna* had, since in these two *comunas* the exploitation contracts for advertising had already been assigned…. The model based on a joint tender was finally the one that could be implemented... as some municipalities did not all have the same possibilities…" (LG2).	
21	"This was an alternative transferring directly to the municipalities that a private company operated the system... and financed by a bank…" (RG3).	
22	"The Metropolitan Regional Government invited a number of municipalities to participate in a new project that was, for the first time, going to implement an alternative transport system considering a great number of municipalities of the Metropolitan Region ... The system for us and for the great majority of the *comunas* was seen as something very far from being implemented ... a relatively elitist system... (however, people) never thought that this system would be implemented in a lower-middle-class and peripheral *comunas...* (now) people see themselves as part of the Metropolitan Region and of higher-income *comunas* than we do" (LG5).	7.2.2 Collaboration
23	"In the beginning… we joined the BSS initiative led by Providencia-Santiago *comunas*... everything was an expectation... " (LG6).	
24	".... we were invited to participate, and some points of bike rental were defined together with the mayor and people from the *Comunal* Planning Office…" (LG4).	
25	"A novel joint contract, new in terms of implementing a transport service... no point of comparison and different municipalities were seeing how the project was going" (LG7).	
26	"Because of the institutional difficulties, as the Regional Government is not an executing entity, those who had to tender were the municipalities" (LG1).	

Table B1-5: Data supporting Interpretations of Second-order themes. Aligned Benefits – Social / institutional benefits: an urban transformation, a new inclusive means for transport. Source: Own elaboration based on Smith, 2014:1602; Stadtler and Wassenhove, 2016:669; Stadtler, 2018:335

	Representative quotes / First - order codes	Themes / Second - order codes	Aggregation
27	".The image and idea of the city was reinforced by the idea of the BSS and ... the BSS was reinforced by the idea of cooperation between municipalities... " (RG1).	Social / institutional benefits: an urban transformation, a new inclusive means for transport	7.3 Aligned Benefits
28	"….(The BSS) allowed to make *inter-comunal* trips ... challenging a logic that does not promote the *inter-comunal* in the city, a logic of urban plots... " (LG3).		
	'An *inter-comunal* system was consolidated when systems were previously seen only in certain *comunas*. (LG6)		
29	".... The system for us and the great majority of the *comunas* perceived … was a relatively elitist system by 'normal' people... they never thought that this system was going to be implemented in a lower-middle-class and periphery *comuna*... people already see themselves integrated in the Metropolitan Region.. " (LG5).		
30	"An alternative means of transport was implemented to support the public transport system….we have a new mobility system without needing to have your own bike…" (LG1).		
31	".The BSS helped to return the bicycle as a means of transport" (LG1).		
32	".I think it has been a contribution, it has covered a real need that some people had… nobody thought that there was going to be this explosion of students, young people,. and micro-entrepreneurs... it proved that the bicycle in Santiago has had an explosive increase" (RG2).		
33	"…. users are charged very low, 5 or 6 thousand pesos a month. Each bike trip is about 300 Chilean pesos… in circumstances where public transport is about 600, the difference huge, then people start using the bikes more" (PS1).		
34	"…. you have [with bikesantiago] a private company that moves 300,000 people a month" (PS2).		

Table B1-6: Data supporting Interpretations of second-order themes. Experienced Tensions: Relationships - Institutional capabilities and reputation. Source: Own elaboration based on Smith, 2014:1602; Stadtler and Wassenhove, 2016:669; Stadtler, 2018:335.

	Representative quotes / First - order codes	Themes / Second - order codes	Aggregation
35	"... it was a good agreement, but a weak one..: (First), as the system was tendered out for a free system for the municipalities ... (they) did not feel directly involved ... as they are not paying, there is less incentive, (municipalities) are less “stakeholders’ or “principals” of the project, and that is a weakness. Second, we have not created a co-ordinating structure for the entire project yet, which is a weakness of ours. Thirdly, I would say that the contract was not well put together either, having not established these clear levels of satisfaction, a system of audits... so I think that there were problems in the original design that have made weak the governance of the project" (RG1).	Relationships - Institutional capabilities and reputation	7.4 Experienced Tensions
36	"What took place here is the provision of a space for a service transaction to be carried out between two private parties. Then, the area was generated; however, no service is associated with the municipality. Therefore, there is no way to control the quality of the service as we do not have non-compliance fines" (LG1).		
37	"In Santiago Metropolitan Region has already implemented a model that is not ideal... a contract with each municipality. There is not a single region-wide governor or a corporation that brings together the municipalities to have a more co-ordinated work....In other words, there has to be a balance in what the sponsor provides, between the prices charged to the users and perhaps another... here in Chile there is no other source of financing, what happens is that here in Chile the model is unique" (PS1).		
38	"We took on a social problem that nobody cared about... we offered the bicycle sharing system to 4 municipalities to implement at no cost for them… The commitment was that we would incorporate other *comunas*, with a symbolic number of stations, and the regional government would be in charge of increasing that coverage ... and that has not happened until now" (PS2).		
39	"(the bank) has a reputation with respect to their brand … people talk about bicycles as ITAU bicycles, so they have a great commitment to making this system works…’ The role of the regional government should be more than just financial but should have a role in managing this" (LG1).		
40	"the Bank is in this [purpose], for the system to work, it is not to go in and out, it is to go in and stay... It's hard, it's risky.... We care that the system works, that it can grow, we are willing to support it, it is ours, we are not going to leave it, but the contractual issues are a governance duty …" (PS1).		

Table B1-7: Data supporting Interpretations of second-order themes. Experienced Tensions: Dilemmas faced in resource allocation.
Source: Own elaboration based on Smith, 2014:1602; Stadtler and Wassenhove, 2016:669; Stadtler, 2018:335.

	Representative quotes / First - order codes	Themes / Second - order codes	Aggregation
41	"...Bikesantiago is a brand that belongs to the bank ... they are B-Cycle LATAM [the service provider] ... we pay because our brand to be present on the bikes and everything related to Bikesantiago. (Ideally) a balance is required between what the sponsor provides, the fees charged to users, and perhaps another source... here in Chile there is no other source of funding... here this business model is unique. Santiago has a model that is not the ideal… there are contracts with each municipality. There is not a single governor in the whole region ... or a corporation that brings together the municipalities, and you can have a co-ordinated work… In addition, here in Chile that [the branding payment] is low, it is undervalued. At the bottom is what they asked us… they charged us less than they should have, there was no business vision ... users are charged very low, 5 or 6 thousand pesos a month. Each bike trip costs about 300 chilean pesos (less than half dollar) … in circumstances where public transport costs about 600 [Chilean pesos, less than a dollar]. Then, people started to use the bikes more [than it was expected] …" (PS1).	Resource allocation and branding & advertising restrictions	7.4 Experienced Tensions
42	"... In general, the contribution made by the bank is equivalent to 60% of the company's annual income, leaving 40% in membership and other income, and this allows the company to have the necessary 'budget' e to operate... [However] here in Chile, the (membership) contribution is close to 20%, and a public subsidy has not been achieved yet.... 'I don't think that a private company has to subsidise the state through advertising… you lose the focus on what you are delivering as a (mobility) service ... you are providing a bicycle, which is being leased to a brand so that people move that brand around the city. That's not a public transport... what you're selling is the rental infrastructure for advertising purposes" (PS3).		
43	'The system that was tendered free for the municipalities, and only at the expense of the sponsors and the memberships…' (RG1)		
44	"Today, they (the service provider) have asked for the regional subsidy ....it is not possible to (directly) subsidise private companies. This is a matter of transferring resources to the municipalities so that they can improve the system. (However), this has not happened yet since there are previously conditions to analyse… we assume that a system like this should be subsidised; however, the regional government role needs to be different. Not only as a financier. This system should be a regional public system…" (RG2).		
45	"A free concession of the land was agreed to promote the system as a public good, as the superior good considered… (However), as the concession contracts are, in general, associated with service standards and as this was not a conventional service concession, what happened here is the provision of the space to allow a business partner to implement the system… In the case of some busiest *comunas,* they have regulations governing the use of advertising…" (LG1).		
46	"... we talked to Las Condes *comuna* who has another system... incompatible today (with BikeSantiago)… they wanted to find formulas to avoid how isolated they are. So far, no formula has worked. The contract has territorial exclusivity...(even) when we tried to integrate the model of Las Condes and the model of 'Bikesantiago', from the political point of view they were in agreement as well as from the point of view of the model too... however, everything 'clashed' when the private ones did not agree... so if you keep looking at the issue from that point of view, this is not a public service" (LG3).		
47	"…we have now a system integrating fourteen *comunas* in Santiago Metropolitan Region, unfortunately one *comuna* - that is Las Condes - decided different, they did not want to join this collective effort" (RG1).		

Table B1-8: Data supporting Interpretations of second-order themes. Dilemmas faced in resource allocation.
Source: Own elaboration based on Smith, 2014:1602; Stadtler and Wassenhove, 2016:669; Stadtler, 2018:335.

	Representative quotes / First - order codes	Themes / Second - order codes	Aggregation
48	"The public procurement was not well developed, not having determined these very clear levels of satisfaction, a control system. so I think, there were indeed problems in the original design that have made the management, the governance of the project weak' …'since the system was tendered ... only at the expense of the sponsor and memberships… the municipalities took distance and they did not feel directly involved... they see, for example, the poor the quality of the service; however, they have not intervened, they cannot apply fines... they are less "stakeholders" less "principals" of the project, and that is a weakness" (RG1).	Dilemmas faced in the organisational structure provision: A de-regulated system and no legal rules	7.4 Experienced Tensions
49	"no one is monitoring the service, even though the contracts says that the municipality may monitor, this is not possible in practice… " (RG2).		
50	'No one was auditing... of course certain levels were established... Although there are mechanisms for auditing…. it must be realistic... For any scheme, regulation is crucial' (PS3).		
51	"I honestly have to tell you the truth. For a long time this contract has been unsupervised... we have not been able to supervise... we do not have measures... basically, the service supervision is minimal today, that is the reality... we claimed that the management system was not what we had defined in the bases, and there we got into a dispute with the service provider" (LG3).		
52	"We let the operator operate 100% autonomously. There is the brand and we take care of the brand presence that is well installed on the bikes... we follow up, we observe... I have an area that is sustainability that is monitoring the system" (PS1).		
53	"There are no indicators... and who could measure them... there is no model of deductions, we cannot control on which parameters to base the system performance. there is no monitoring, there are places where the priorities are very big and others where they are ignored... the indicators can be developed but in relation to what?" (PS2).		
54	"There are no clear rules, a realistic regulatory framework. Any company that does not have a regulatory framework is falling into the middle of nowhere ... into chaos. And in that mess some people win and some people lose. So the winner is the 'unscrupulous' entrepreneur and the loser is the 'normal' citizen requiring alternatives. That is for me a crucial aspect, a realistic state action... if you look at the concessions and in particular for the public bicycle system, there are tools that allow to control these services, but they are not operating in practice" (PS3).		
55	"As it is a public good, (the system) must be treated as a (public) transport system, (however) the bicycle is not recognised as a means of transport either, and this would allow you greater regulation. (Furthermore, the system) also does not have the supervision of the Ministry of Transport, which requires conditions in which it must circulate or where it must be located" (LG1).		
56	"... there is a need for a legal regulation that allows this system to be considered as a means of transport and not as a private renting service... by promoting, supporting and regulating these 'modern' transport systems (without it) you are facing a risk of not delivering the service, giving a low-quality service, increasing prices, and finally harming the quality of life of people" (PS3).		

Table B1-9: Data supporting Interpretations of second-order themes. Experienced Tensions: Dilemmas faced in the organisational structure provision: Informational Problems. Source: Own elaboration based on Smith, 2014:1602; Stadtler and Wassenhove, 2016:669; Stadtler, 2018:335.

	Representative quotes / First - order codes	Themes / Second - order codes	Aggregation
57	"… (there were) doubts on... what the company is really providing… today, in theory contracts say that there should be two thousand bikes, but everyone believes that there are less, just from a simple perception" (RG2).	Dilemmas faced in the organisational structure provision: Informational Problems	7.4 Experienced Tensions
58	"… We do not know for sure the real number of users... They give you a number, but we have nothing to verify it" (LG2).		
59	"there are no conditions to transfer this type of resources without knowing what is the current situation of the system….it is a very fragile system because there is a lack of management... we have no data regarding the financial data of the service" (RG2).		
60	"Some (municipalities) asked for reports and basically these were a word document that you could write anything, and there was no control over whether those data were real" (PS3).		
61	"We have... we must have 600, but why do I say "we must have" because in line that it is not possible to proceed with a control system, we do not know how many bikes are here... "We don't know anything" we can't follow up.… (users compliances) is another severe disassociation, because the bases also say that he must inform us (municipalities) of all the claims that are coming… (however) we have nothing, we have no idea of the claims that are coming, not at all" (LG3).		
62	"The system, in our opinion, does not fully comply with the requirements on the system that establishes the bases of our tendering. It is a system that tries to solve the management problem of all the services of public bicycles that they have. (Likewise) they have far more system attributes that we require, it has far more information of the users and it does not contribute in a friendly and faster way with the required and that is established in the contracts… there is a lack of system of management to which we can accede… and has been a subject of permanent conflict with the operator " (LG3).		
63	"We lost all contact. This system was implemented and each one was isolated, there have been no joint evaluation processes, that one would expect after implementing something so innovative you would get together to evaluate and how it is working. There has been no evaluation process, or at least at a hierarchical institutional level this has not been done. Nor do I know if at the level of technical inspection" (LG4)		

Table B1-10: Data supporting Interpretations of second-order themes. Experienced Tensions: Dilemmas faced in the organisational structure provision: Control Demand. Source: Own elaboration based on Smith, 2014:1602; Stadtler and Wassenhove, 2016:669; Stadtler, 2018:335.

	Representative quotes / First - order codes	Themes / Second - order codes	Aggregation
64	"For us, it was critical to start from a low- flow *comunas* and *intra-comunal* trips…. (then) it was very complex to expand (the system) to the two most important *comunas* in Santiago city -Santiago Centro and Providencia- so we learned day by day... it was complex to first understand the idiosyncrasy… to observe the flow of bicycles, to redefine some stations regarding the residential and commercial sectors... we had nothing pre-established and we processed as we went along... (Then) We formulated the concept of the lung, which we call the bike collection for the times of greatest use. We leave a daily supply of approximately 400 (extra) bikes in the Costanera Centre station, or 100 (extra) bikes in Pedro de Valdivia station… preparing the system, we leave the main stations almost at the limit operation in those points"… "We have a (manual) operator at some busiest stations... this person is taking the bicycles out of the storing and inserting them into the dock stations…(however), to collect a bike is always by card " (PS4)	Dilemmas faced in the organisational structure provision: Control Demand	7.4 Experienced Tensions
65	"With regard to improving fleet balance times, travel routes need to be improved. We made a presentation requesting permission to use the exclusive routes for public transport. However, the minister of transport did not agree, arguing that it cannot set a precedent in authorising a private company to use the exclusive routes for public transport because otherwise any private company will do the same… My argument was 'if you have a private company that moves 300,000 people a month, let's talk. But there isn't, what we have to assume is that this private company, this new means of transport is part of public transport " (PS2).		
66	"they wanted the forced balance to be the basic, minimal and the spontaneous balance to be maximum, to be predominant… there is a minimum number of logistic vehicles required in the bases... we have very few tools to control" (LG3).		
67	"Where you have a service where you need 30 to survive and you're making 5, you have to start generating cutting corners in the operational budget... what is cut are the levels of maintenance… there is no longer preventive maintenance only corrective maintenance… therefore it begins to generate a decline in the service quality, and also begins to generate debt… (and then) you are no longer to buy the same wheels … until the system can no longer work…" (PS3).		
68	"I don't know if they expected such a demand... I feel that there is a low capacity to react, ... to adjust the network. the smaller the *comuna,* the less capacity you have to react, you start to prioritise the emergencies, and this is not yet an emergency" (LG5)		

Table C1-11: Data supporting Interpretations of second-order themes. Experienced Tensions: Paradoxical institutional and organizational tensions: Stability and flexibility & certainty and uncertainty. Source: Own elaboration based on Smith, 2014:1602; Stadtler and Wassenhove, 2016:669; Stadtler, 2018:335.

	Representative quotes / First - order codes	Themes / Second - order codes	Aggregation
69	"This is a country without a perspective of the future, a small view of a small plot of land on a daily basis... the system started as an initiative of a group of entrepreneurs... nobody saw the impact that it could have, and suddenly it started to grow and grow and grow... in Chile we are not strategic... there are short governments, looking at their four years... A long-term strategic vision, the businessmen, everyone applauds that, that's the vision, the type of political vision that is missed" (PS1).	Paradoxical institutional and organizational tensions: Stability and flexibility & certainty and uncertainty	7.4 Experienced Tensions
70	remember that the dock stations were proposed to us and when we asked for more stations, they reply they cannot provide more, (arguing) first we have to start with this, this, this... and then we will see how many more stations we can give to the *comunas*... that is part of another agreement that we will have to sign with the company" (LG6).		
71	"No, we do not have any relationship with them (users). SERNAC (National Consumer Service) has a relationship with the users... People do not link the system to municipalities either, they relate to Bikesantiago directly. People do not click on the fact that it is a municipal or regional service" (RG2)		
72	"I don't think the solution is either ... that a private company assumes a subsidiary role… mainly because you lose focus on what you are delivering as a service ... you are providing a bicycle, which is being leased to a brand so that people move that brand around the city. That's not a public transport... what you're providing (as a BSS) is the rental structure for an advertising system" (PS3).		
73	"There was a lot of stress with certain municipalities e.g. Vitacura. And there were others that were not taken into account, for example Recoleta. And demanding what they wanted, (this last *comuna*) it did not matter…" (PS3)		
74	"As we asked for some information to SERNAC… we have had meetings with the operator and the sponsor… (however) No governance structure is created yet (for handling those issues) ... Users are on their side, claiming to the operator... Paradoxically, people know that we (Regional Government) play a leading role in generating it, but people recognise an operator (it means that) people do not complain to the municipality, nor to the regional government, but they complain to the operator, which is good on the one hand, as it generates the required pressure where it has to be put, but it is bad on the other hand, as there are no political incentives for those of us who are the authorities to be in charge of the system regarding the issues... we are obviously concerned about the issue… , but it has been a difficulty" (RG1)		
	"(There is) a set of claims ... associated with the consumer wrongfully charged made by the supplier, also duplication of charges…. ...We (SERNAC) have realised, considering the important volume of complaints received, that the company was overwhelmed from a management perspective... the usage of this type of systems has been very intensive in general terms. And, also the company itself has recognised certain problems that they have with the software that administers the accounts of the users....." (E4)		
75	"There is a lack of expertise, of determination, a lack of management capacity, You do not know how much the demand will be, it is difficult to estimate it... today, we are in a very important moment of opportunity" (PS1).		

Appendix B2 Topics of the semi-structured users' interviews

Table B2-1: Data explaining negative experiences using the BSS. Source: Own elaboration

		Representative quotes	Aggregation
1	Man	"In the area where I often take a bicycle in the afternoon, after 5 o'clock there are no bicycles. I am always facing this issue" (U01)	Negative experiences: system performance
2	Man	"The charging system is the one that makes me a bit doubtful about how the system works because of the poor maintenance of the stations. When I return the bicycles (when I lock them) it doesn't 'close the trip', and it remains open. Then, if I don't notice, they charge me at the end of the month. The charge doesn't come out month by month, sometimes every other month, then every two months. So that's worrying and messes things up financially. I have no information about how my month of travel went. Almost every month there are differences... for example in one month it appears $7990 Chilean pesos (US$ 11) ... in the same month, they charge me more, I don't understand it… " (U02)	
3	Man	"I have had problems this year with not being able to collect a bicycle... the dock stations seem locked. Also, bicycles are in bad condition" (U03)	
4	Woman	"The bicycles are not always in good condition to ride, and it is becoming more and more frequent to fall out of the system.... even if you see that there are bicycles, you often cannot collect them" (U04)	
5	Man	"I noticed that there were some 'undue' charges for the monthly fee. Instead of charging me once (the monthly fee), I was charged three times in the same month without a notification. I feel uninformed even sending a report to the company but they gave me 15 working days for a response ... In my case, Independencia/Hospitales station was very convenient for me, but it is no longer working, and now I have to walk much further to the closer station, and it is about 200% longer than before, walking four times longer than before. However, it's still a convenient service" (U05)	
6	Man	"When I try to collect a bicycle, the station is locked. It seems you can collect a bike as the green light appears so you can collect it but, the bicycle looks like it's locked. However, it appears [in the records] as if you collected it. Then, it appears as if you haven't returned the bike, so you are charged. When I called to report these issues, they told me that it appears as a charge over what it should be so I will receive a refund; however, I haven't received it yet. I don't know if this solution will work. I have to keep checking the system as I find charges that do not correspond. Also on this credit card I only have this service, but if I had other payments I wouldn't notice it" (U06)	
7	Man	"My experience has not been very good. The application was updated; however, it is not showing my trips (made). I can't see now my trips records... The biggest problem I have had is with regard to the charges. I've been cut off of the service because of errors in the billing, or there have been months when they stop charging me for several months and then charge me in one instalment. There are times when they charge you three times more ... that makes me doubt whether or not to continue using the system, plus you have to keep calling, asking why this is happening... when they charge you three months in a row, I requested them to please stop charging me more so it caused me to cancel the service for a while" (U07)	

Table B2-2: Data explaining negative experiences using the BSS. Source: Own elaboration

		Representative quotes	(continuation)
8	Man	"My experience is not very good because of errors with my trip records. It's hard to close the trips. For example, when I am trying to collect one, sometimes it is locked; however, the trip remains open, then I have to call them to close the trip, and I can't use the system. Regarding the call centre, they don't answer the phone. I had to send a message on Twitter to have an answer. The service says it is from Monday to Sunday but on Sundays they don't work and this is the third time I have complained to them because they are charging me wrongly and there is no answer. In short, the after-sales service is disgusting. It is disgusting. The service is bad and I don't recommend it. " (U08)	
9	Woman	When they charge me 'undue' fees it's not because I've taken longer than necessary... there's no justification (U09).	
10	Woman	"The negative part is not being able to communicate effectively with the company as they charge you more automatically [it seems] they can charge you whatever they want from your credit card per month, and as many times as they want. Well, it seems to me that they do it through an overtime.... That's why I try not to do overtime and that's why they can't charge me anything more than the monthly fee at the end of the month. However, if I go to my bank account, I see that they are charging me more... I sent an email to the company but I haven't answered me for a month... I feel very insecure about not getting a reply" (U010)	
11	Man	"I had serious issues with the payments and an apparent system overuse, yet I was unable to use the service for a period of time. However, they charged me even though my (credit) card was unused. Communication with them (the service provider) is hard. I found out their address so I arrived at their offices. They gave me a resolution that I had to pay an amount to resolve the issue regarding the overuse but I don't have the information in this regard although perhaps the bicycle was not well anchored... I don't know what happened. To end, I decided to pay them that amount and then they gave me a benefit of two months free, but it was a very annoying situation. in reality, this system it is not working well... I understand that these things that require technology can fail, but this is too much" (U011)	Negative experiences: system performance
12	Woman	"I have a record of a payment or charge that was three times more than what I agreed to pay. When I asked for clarifications in this regard, they promised to give me a solution a week later... I see the details of B-Cycle LATAM, or the company's business name and I see amounts that I did not contract... they are different amounts. I called them yet they are not answering the phone.... the idea is good, but it is not consistent with what should be delivered, the call center does not work, and the machines are poorly maintained.... I am not satisfied with the service" (U013)	
13	Man	"I have had every month additional charges. I called the call centre, ... [and] I have to do the work because they could not give me the answer. I have to see all the charges that the company B-Cycle LATAM has made to me. That's the name that appears on my account, which is why I never associated it with Bikesantiago... Other complaint is regarding the poorly condition of the bikes...My opinion is that it was done, unilaterally, without informing me, without a contract annexe, and the right to use this service was not respected" (U014)	
14	Man	"I have found poorly bicycles maintenance. Many times I can't take them to the stations .. they have a lot of damage" (U015)	
15	Man	"Every day you find [bicycles with] bad brakes, broken wheels... The conditions go from bad to worse, there is no technical service [to repair], there is no communication with the company directly, there is no progress in that" (U016)	
16	Man	".. bicycles have been in poor condition..." (U018)	
17	Man	"the (lack of) maintenance is a frequent issue that is happening... the issue of the gears, brakes..." (U019)	
18	Man	"In the last three months they have been charging me amounts that do not correspond ... I am getting two or three [extra] monthly charges ... those amounts do not make sense ... because I commute every day 10 min aprox ... And I never travel further than that. There is little clarity ...I have no information about the charges made by the company". (U020)	

Table B2-3: Data explaining negative experiences using the BSS. Source: Own elaboration

		Representative quotes	(continuation)
19	Woman	"I am being charged more since the rate change. Checking my credit card I noticed that they were charging me almost double the monthly membership every month. They are also charging me additional (costs) ... and I don't know why" (U021)	Negative experiences: system performance
20	Woman	"In October they say that I stole a bicycle. In October this (the application) did not exist. I didn't notice it when I paid (the credit card), they charged me with 192 thousand of [Chilean] pesos [US$270]... I called the call centre and they told me 'madame, it was about the bicycle number xxx' which they say it disappeared. I told them that it might be in the warehouse... why don't they look for it? Why are they charging me for it? They argued I took it out and never returned it, I have never taken it out. I was going to talk to a lawyer but well, I already paid for it... Given the characteristics of everything that has happened, it relates to abusive charges... this company does not fulfil the contract.... The contract says that there is permanent availability of bicycles... however, it i not always availability of bicycles, especially at peak times when everyone leaves... they should know that all these are the users and there will never be the same amount of bicycles..." (U022)	
21	Woman	"Actually (the system) is not working well because I check my application, I associate my card and the trips I made are not there, or they are mixed up. There are some (of the ones I did) but there are some extra ones that I didn't do. There are also extra minutes of overtime that I didn't do... [also] the payments are not right... and I and I have seen that many people claim the same thing, that you associate it to the automatic payment, you give them your credit card details and they charge you what they want!" (U023)	
22	Man	"It could be that there are charges that may eventually be 'undue' because having already handed over the card and seeing how the system works, you realise that ... the card [trips records] is telling me that I'm travelling when I'm not. Or also the card is blocked because I leave the bicycle in a station and I want to take another one out but I can't take it out [a bicycle]..."(U024)	
23	Man	"You don't receive details of your charges. There are no receipts or receipts with a summary of the trip charges, nothing. … there is no information so there are charges for trips that you have not made or trips have not been closed... they also do not give you the details of what time it was or when it was. That would be (in short) the problems with the charges... because I pay for a membership, and now they have raised it without warning. That charge was doubled... (also) there have been smaller [extra] charges. I have to be asking what happened and why they are charging me that [amounts]... they don't send me the information about these (additional) charges, you never know.But the other side is about the charges and the lack of information you have. There are no physical offices, there is no bill or receipt... (that makes me) distrust about the company.... SERNAC (Nacional office of consumers) said that I should file a civil lawsuit, with all the details to get my money back. That's the only thing they can recommend. They (this public office) act as intermediaries. If it doesn't work, either a class action suit or a civil suit in person in a local police court, I provided with all the information ... this is about, is not fair they are charging you arbitrarily. If it continues like this I will look at other transport options... otherwise (soon) I will have to buy a bicycle and find a safe place to park it " (U025)	
23	Man	"I have an accumulated overtime and it doesn't make sense to me. At the beginning I called them many times complaining because I had doubts about it. [I perceive] instability, lack of security... it ends up being a bad alternative of transport". (U026)	
24	Woman	"... I have an application to know how many bicycles there are [availables] in a station and spaces to leave the bicycle in a place. [However] I still don't have any information about my trips...." (U028)	

Table B2-4: Data explaining negative experiences using the BSS. Source: Own elaboration

		Representative quotes	(continuation)
25	Woman	"it is an automatic charge without any kind of notification... There is no information that has to do with charging. (My perception of this is) that they are not very well organised neither honest... before contracting the service I saw the complaints... Now I get a 36 hour trip (on the app) and I have not been there. (My impression is that) the bicycle itself is wonderful. But the service sometimes makes me angry. When I have problems at the stations, or see these things [about errors regarding my trips], I wonder how it can be possible... my route is always the same and I don't take more than 20 min...Obviously it scares me (having given my personal bank details). And as I have seen these complaints... I'm also afraid that I'm not using it and I'll still be charged." (U029)	
26	Man	"I never know if I had really finished the trip or if I really started it, you just collect the bike and then return it... [however] no trips are registered... the website [with the records] has also failures... (it appears as) page in maintenance... I have a lot of doubts about whether or not the charges have been due to that... and it is the only thing I have as automatic payment. This is the only system I've gone through and I have doubts" (U030).	Negative experiences: system performance
27	Man	"The system maintenance is poor.. they don't check well the state of the bikes" (U031).	
28	Man	"There are doubtful charges... the company is very bad. I was also suspicious but I thought it would be isolated events.... With regard to my data and payments, I obviously feel vulnerable because at any moment, they can charge me more" (U032).	
29	Man	"The bicycles are not in good condition... neither are the stations. Sometimes I records of trips that I haven't done... I don't understand it." (U034)	
30	Man	"I have received unjustified charges... ... and the company is not replying [my complains]... the system is not working correctly" (U035)	

Table B2-1: Data explaining positive user experiences using the BSS. Source: Own elaboration

		Representative quotes	Aggregation
1	Man	"The main thing for me is that I can take the bike and leave it wherever I want. The ease for me is that I don't have to worry about the bike, and I don't have to do any maintenance" (U01)	Positives experince and perceived benefits
2	Man	"It is faster ... I save time" (U02)	
3	Man	I use the system because it makes it easier for me to save time, money and exercise. I have been using it for almost a year now, which has been very beneficial for me" (U03)	
4	Woman	In my opinion it is efficient. I have had no problems with the system" (U04)	
5	Man	"My experience is positive, I have saved a lot of time commuting. It is also easy to make stops along the way... In general terms, the service has been very beneficial as ican save a lot of time compared to the traffic here in Santiago. Before I used to travel by metro ... A lot of traffic, a lot of people. Sometimes the metro doesn't work, or it takes a long time to arrive.... affecting my mood. Sometimes I was stressed out, and also the heat... my routine used to be stressful. That's why I decided to use the system" (U05)	
6	Man	"One of the main reasons why I use the public bicycle was to get out of the metro. The other reason is to maintain physical activity, especially when working, it is much more difficult to maintain physical activity. So cycling helps me to keep active " (U06)	
7	Man	"My experience has been better riding rather than travelling by underground or bus at rush hour, also in the evening I like to enjoy the scenery and exercise" (U07)	
8	Man	"Using a bicycle is priceless, much more comfortable, faster... better quality of life" (U08)	
9	Woman	My overall experience has been good in the sense of being able to use a mode of transport that you can return it elsewhere and not having to leave the bike (personal) parked because of theft, especially to come to work" (U09)	
10	Woman	The system is good for me, I save money, time, I do a bit of physical activity" (U010)	
11	Man	" I think the system is a very good initiative, very good, I take 25 minutes on my journey. I contribute to less congestion in this city, less pollution, less noise... it's a contribution, and I get some exercise" (U011)	
12	Man	"I think it's a good system, I haven't had any problems" (U012)	
13	Man	In general I think the system is good, it solves the need for transport." (U013)	
14	Man	"This system has taken away my stress... I am in good spirits, so the benefit is health and also speed... the cycle lanes have improved... " (U014)	
15	Man	" ... I save the traffic, (the negative experience travelling in) the metro, the buses, everything related to Transantiago [public transport system]. I have to get up earlier than before but it's worth it." (U015)	

Table B2-2: Data explaining positive user experiences using the BSS. Source: Own elaboration

		Representative quotes	Aggregation
16	Man	"there it's more comfortable to commute by bike [avoiding] the chaos in the metro." (U016)	Positives experince and perceived benefits
17	Man	"If I bought a personal bicycle, I wouldn't have anywhere to put it, it wouldn't fit in my flat, nor in the office. It would bother me to ride a bicycle at the moment. So as [this system has]... stations everywhere, it's very easy to take a bicycle and leave it anywhere, when you can." (U017)	
18	Man	"My experience has been good, it contributes to my routine with respect to stress and saving time." (U018)	
19	Man	(My experience using the system is to feel) Relief... before I used to use the metro. It was getting to the station, it's full, waiting for one car to pass and another one to come by." (U019)	
20	Man	"My routine before was to travel by metro-train or Transantiago, which is always full [of people], with the risk of being robbed... today I take less time [to travel], I walk more comfortably and I exercise, which for me are the main things [reasons]... the time I reduce [in travel], then there is the physical activity. Saving [money], and the autonomy I have by cycling. Before, I used to take 30 minutes on the metro... always in a heavy, crowded, crowded transport, exposed to being robbed. Or in Transantiago (bus) you can be stopped for 30 minutes at a traffic light and with the bicycle that doesn't happen to me...those are the main advantages of using a bicycle as a mode of transport." (U020)	
21	Woman	I feel more agile (the system) has helped me a lot with [reducing] stress." (U021)	
22	Woman	"It made it easier for me to get out of (the comuna of) Vitacura, ... The transport in Vitacura is terrible. Here there is (a bus) 03. It's dramatic. The bicycle gives me an autonomy that a car does not. Because I don't depend on others. I don't have to wait 30 minutes for the bus, I don't depend on a taxi that gets stuck in a traffic jam. (Therefore) my main motivation to use the bicycle was the autonomy and the shorter time to reach my destinations." (U022)	
23	Woman	"It is convenient for me because I need to come home quickly because I need to see my baby, I need to meet work schedules." (U023)	
24	Man	"The benefit is more in terms of health, the congestion, avoiding the stress of having to go to the metro and being cramped ... I want to save those 20 minutes walking and getting on the metro full of people at peak time.... Despite all the problems, I still use it. But honestly I'm evaluating whether to keep using it because of the problems it has." (U024)	
25	Man	"I am saving time, it gives you physical activity and improves your quality of life. Thanks to the service (Bikesantiago) I have stayed motivated coming to work. Every trip is like a different experience." (U024)	
26	Man	"I like cycling so much that I tried to become a client of the ITAU bank in order to have more time to use the system ... because I had accounts in other banks and because they asked me to give up a current account in another bank and I didn't think it was necessary. The benefit is the opportunity to ride the bike, I have had the opportunity to save time on some occasions, when everything works out well, when I leave the house... I take the bike and I find a place [to park it], it's perfect, wonderful. Also [it is] a physical benefit ... now that I found this alternative to keep me active ... with physical capacity.... " (U026)	
27	Woman	"It is a good service in general, the benefit are good, both physically and for not arriving stressed at work... Basically because it works for me, it solves a problem... when you arrive in Santiago from the *comuna* of El Monte (metropolitan region) I had to think if I was going by taxi, bus or metro.. [while] one is more expensive, the other is more stressful. So among the alternatives I had, this is the best one" (U027)	

Table B2-3: Data explaining positive user experiences using the BSS. Source: Own elaboration

		Representative quotes	Aggregation
28	Woman	"[I am using the BSS] to improve routine... [this is] a 'liberation'... it is very important to me this physical activity... " (U028)	Positives experince and perceived benefits
29	Woman	"[I am] saving time, [doing] physical activity... [I have a] better mood... I like cycling. Also, experiencing a trip in which there are difficulties because you are in traffic ... that also leaves me bitter ... those things affected my mood.... now (using the system), i am independent" (U029)	
30	Man	"The main motivation [to use the system] is the physical activity, and I have always liked cycling... So the best excuse cycling again was to commute by bike.... the main motivation is to reduce the stress... you get off the bike and with a lot of energy. The other benefit I love about the system is that it is 24/7 service. It has saved me from unexpected situations like running out of transport a long way from home... [and] I'm saving money". (U030)	
31	Man	"It's easy for me to use the system. ... it works well for me". (U031)	
32	Man	"For the moment [the system] works for me... the convenience [using the system] is that, I don't have to park my own bike as it can be stolen. I am saving time, I have more energy; however, I'm still evaluating [if I am continuing using the system]." (U032)	
33	Man	"[the system] can be improved... it's a good service and a good idea." (U033)	
34	Man	"The system doesn't work very well, but it still works for me, I am saving time, which helps me avoid the traffic in the afternoon." (U034)	
35	Man	It's convenient... so I don't have to leave mine [my bike] parked [at the street]." (U035)	

APPENDIX C. Cash flow (assessed in the regional business model)

ITEMS	PERIOD (YEARS)										
DBOMF Mixed - Manual System + subsidy + no NGP tax	0	1	2	3	4	5	6	7	8	9	10
REVENUE											
BSS MEMBERSHIP		581,888	737,958	1,119,461	1,510,597	1,529,865	1,549,133	1,568,401	1,587,669	1,606,936	1,626,204
PARKING MEMBERSHIP		290,944	368,015	558,767	755,299	764,933	774,566	784,200	793,834	803,468	813,102
ADVERTISING		1,637,765	1,637,765	1,926,782	1,926,782	1,926,782	1,926,782	1,926,782	1,926,782	1,926,782	1,926,782
COSTS											
ADMINISTRATION		(211,946)	(233,141)	(306,358)	(354,528)	(358,382)	(360,308)	(362,235)	(364,162)	(368,015)	(369,942)
STAFF		(1,475,915)	(1,287,091)	(1,371,869)	(1,425,819)	(1,425,819)	(1,425,819)	(1,425,819)	(1,425,819)	(1,425,819)	(1,425,819)
CONSUMABLES AND OFFICE SUPPLIES		(11,561)	(11,561)	(15,414)	(19,268)	(19,268)	(19,268)	(19,268)	(19,268)	(19,268)	(19,268)
TRANSPORT (LOGISTIC)		(119,461)	(119,461)	(119,461)	(119,461)	(119,461)	(119,461)	(119,461)	(119,461)	(119,461)	(119,461)
MAINTENANCE		(329,480)	(346,821)	(364,162)	(381,503)	(400,771)	(421,965)	(443,160)	(464,355)	(487,476)	(512,524)
RENT		(208,092)	(208,092)	(208,092)	(208,092)	(208,092)	(208,092)	(208,092)	(208,092)	(108)	(208,092)
BSS ADVERTISING AND COMMUNICATIONS		(77,071)	(84,778)	(109,827)	(129,094)	(129,094)	(131,021)	(131,021)	(132,948)	(132,948)	(134,875)
IT		(82,852)	(82,852)	(82,852)	(82,852)	(82,852)	(82,852)	(82,852)	(82,852)	(82,852)	(82,852)
INSURANCES		(11,561)	(11,561)	(15,414)	(17,341)	(17,341)	(17,341)	(17,341)	(17,341)	(17,341)	(17,341)
OTHER		(19,268)	(19,268)	(19,268)	(19,268)	(19,268)	(19,268)	(19,268)	(19,268)	(19,268)	(19,268)
SMART CARD COST		(69,364)	(88,632)	(134,875)	(181,118)	(183,044)	(184,971)	(188,825)	(190,751)	(192,678)	(194,605)
NGP FEE		(533,719)	(533,719)	(533,719)	(533,719)	(533,719)	(533,719)	(533,719)	(533,719)	(533,719)	(533,719)
DEPRECIATIONS		(223,507)	(233,141)	(244,701)	(254,335)	(279,383)	(304,432)	(350,674)	(375,723)	(208,092)	(244,701)
RESULTS BEFORE TAX		(861,272)	(516,378)	78,998	464,355	443,160	420,039	375,723	350,674	520,231	481,696
TAX		171483.6224	104046.2428	(15,414)	(92,486)	(88,632)	(84,778)	(75,145)	(69,364)	(104,046)	(96,339)

RESULTS AFTER TAX		(689,788)	(412,331)	63,584	371,869	354,528	335,260	300,578	281,310	416,185	385,356
DEPRECIATIONS		223,507	233,141	244,701	254,335	279,383	304,432	350,674	375,723	208,092	244,701
INVESTMENTS											
BICYCLES	(1,055,877)										
DOCK STATION	(3,932,563)										
VEHICLES	(460,501)										
CAPTURERS	(88,632)										
HOSTS	(5,780)										
OFFICES	(67,437)										
SOFTWARES	(67,437)										
START-UP COSTS	(19,268)										
GUARANTEE STATEMENT	(211,946)										211,946
RE-INVESTMENT		(105,973)	(136,802)	(716,763)	(275,530)	(277,457)	(797,688)	(283,237)	(290,944)	(805,395)	(296,724)
WORKING CAPITAL	(526,012)	(48,170)	(181,118)	(123,314)	(5,780)	(5,780)	(5,780)	(5,780)	(5,780)	(5,780)	913,295
SCRAP VALUE											917,148
CASH FLOW	(6,433,526)	(620,424)	(497,110)	(533,719)	342,967	350,674	(163,776)	360,308	360,308	(188,825)	2,375,723
Discount rate			**15,4%**		Mixed - Model Investment					264%	
NPV			**(3,444)**								
IRR			**- 9,7%**								
DBOMF MIXED MANUAL SYSTEM + SUBSIDY + NO NGP FEE											
NO NGP FEE		533718.6898	533718.6898	533718.6898	533718.6898	533718.6898	533718.6898	533718.6898	533718.6898	533718.6898	533718.6898
TAX EFFECT		(105,973)	(105,973)	(105,973)	(105,973)	(105,973)	(105,973)	(105,973)	(105,973)	(105,973)	(105,973)
SUBSIDY (INVESTMENT IN ASSETS)	5,678,227										
CASH FLOW	(757,225)	(192,678)	(69,364)	(105,973)	770712.9094	776493.2563	263969.1715	788053.9499	788053.9499	238921.0019	2,801,541
NPV			**1,154,143**								
IRR			**30%**								

London, July 2021