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ROME'S LOCAL PUBLIC TRANSPORT SYSTEM: HOW TO TRIGGER A RESILIENT TRANSFORMATION TOWARD SUSTAINABILITY?

Introduction. – Local Public Transport service (LPT) and the terms of its provision are topics of the utmost importance for Rome, as well as for many other cities in the world, in order to achieve effective and sustainable urban mobility and improve health and the overall quality of life of citizens. It was shown in a recent Conference[1] how many Romans might look favourably at a competition-based model of LPT supply due to negative impacts of ATAC on the local administration's budget[2]. However, there are also supporters of the *status quo* who emphasize the risk that liberalization might *de facto* turn into a privatization process and therefore into a sale of the know-how that the publicly owned firm has accumulated in several decades of its operation.

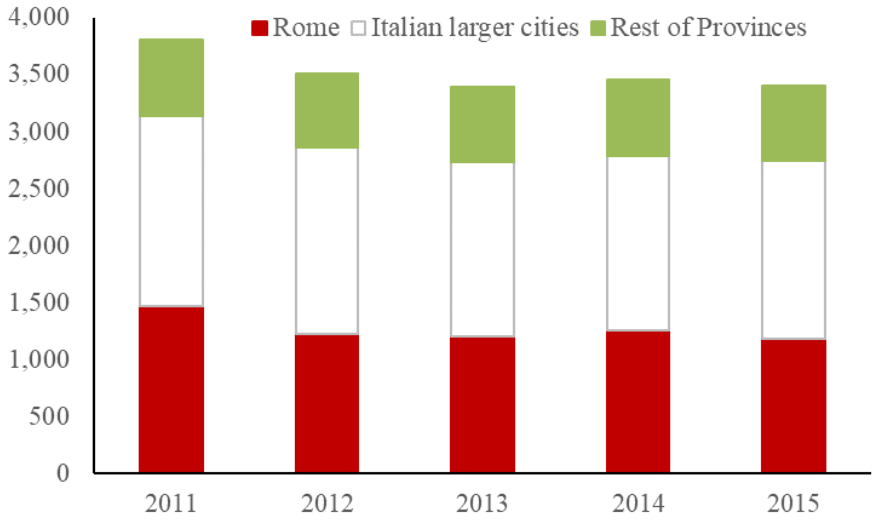
Figure 1 highlights the relevance of Rome's LPT system in Italy, as it serves, on average, a 75-85% share of all users observed in the other larger Italian cities, i.e. a 35-40% share of the users monitored at the national level. Furthermore, the data illustrate that the number of urban LPT users in Italy slightly decreased from 2011 to 2016 (from 3.807 billion users in 2011 to 3.406 billion users in 2015), and the negative change was more consistent in Rome than in the other Italian larger cities (overall, almost -20%). This evidence has often been associated with the effects of the global financial crisis on the demand for local transport services, but it also might depend on issues concerning the supply side (i.e., decrease in service quality, reduced reliability of travels…) and the de-

[1] The Conference *Liberalization and innovation in the public transport*, held the 24th of May 2018 by the Roman Radical Party at the Italian Deputy's Chamber.

[2] ATAC is the acronym for "Azienda per i Trasporti Autoferrotranviari del Comune. *ATAC Nuova Agenzia per la mobilità* is the publicly-owned local firm operating in the LPT sector in Rome under a monopolistic regime.

creasing quality of the territorial context (enduring urban sprawl, amplified polarization, cumulative socio-economic divides…). Indeed, the second interpretation seems more appropriate, as the sovereign debt crisis contributed to exacerbate the lack of available funds for public spending both in the local and national administrations. However, more in-depth analysis is needed to validate or reject this hypothesis.

Fig. 1 - *Annual level of LPT urban users in Italy (million per year)*



Source: our elaboration on ISTAT data. "Italian larger cities" include: Turin, Genoa, Milan, Venice, Bologna, Florence, Naples, Bari, Palermo, Catania. "Rest of Provinces" include all other provincial capitals

Going back to the analysis of Rome's LPT system, it is worth noting how ATAC, during the last ten years of its operation, has revealed weaknesses that might be imputed to a wide array of exogenous and endogenous causes. First, a major issue to address is the hyper congestion that characterizes Rome territory (Vv. Aa. 2013, p.213-20; Perretti, 2014, p.117; Vv. Aa., 2018) that at the same time thwarts input productivity and service quality. Second, fare evasion has consistently depressed the amount of revenues collected (Lupidi, 2010; AGCM, 2016; Bitetti, Genovese, 2016; ASPL, 2018, pp.21), raising the need for public subsidies far beyond real financial needs. Third, the average age of ATAC's fleet is increasing and the vehicles often show signs of malfunctioning as labour

costs and other current expenditures absorb almost the whole budget allocated for operations (Perretti, 2013, p. 120; ASPL, 2018, pp. 11-15). Fourth, the absenteeism is high compared to the one observed in other Italian firms operating in the LPT sector, and that exacerbates the already low labour productivity (Marabucci, Spirito, 2016; ASPL, 2018, p. 14). Fifth, ATAC's governance has shown to be dysfunctional under several profiles, as many stakeholders might have postponed common interests in favour of their personal ones[3] (Danovi, Kerletsos, 2010; Perretti, 2013, p.119; Vv. Aa., 2013; Bitetti, Genovese, 2016). Finally, the mobility sector is facing a technological revolution that is affecting Rome's LPT system as well, and in the future it will be difficult to match technological innovation and protection of labour rights.

Lying on these premises, while fostering the "resilient transformation" (Giovannini, 2018) of Rome's LPT toward sustainability, the research focuses on the analysis of the major issues debated in the international and national literature on local public transportation, and the influence of the territorial context on both the demand and the supply of mobility services. Moreover, the research briefly summarizes the milestones that characterize the historical trend of Rome's LPT system, and assesses its current status, to identify all major sources of inefficiency and ineffectiveness, and the available "institutional space" for the implementation of new policies. Finally, the research discusses a collection of stylized facts that could shed light on the relevance of internal and external factors in determining ATAC's inefficiency and suboptimal performances.

A brief literature overview: the elaboration of a multi-level framework of analysis. – In this paragraph the main theoretical issues collected at international, national and local level are briefly summarized, with the aim of identifying three pieces of a common framework of analysis involving macroe-

[3] During the Conference on May 24th 2018, it was argued that the Municipality of Rome had often confused the role of stockholder with the one of managing authority, and that several ATAC managers based their decisions on local political influences. Furthermore, it was claimed that labour unions had often represented workers' individual rather than collective interests, and several suppliers had signed agreements with ATAC under extremely favourable conditions due to private connections (see also Vv. Aa. 2011, p. 955; Peretti, 2013, p. 122).

conomic trends, public policies and local needs. The three approaches are integrated to provide an interdisciplinary perspective of analysis on Rome's LPT system.

i) Integrating transportation economics and spatial planning. – The *International Conference Series on Competition and Ownership in Land Passenger Transport* (known as Thredbo series) is a pillar of the international literature on transportation economics. The first conference was held in 1989, and since then 14 biennial conferences brought a heterogeneous public of experts to discuss matters of mutual interest (Bray, Hensher, Wong, 2018). It is worth noting how the first Thredbo conference was held few years after the United Kingdom's bus and coach industry reforms initiated in 1985 with the *Transport Act*[4]. Economists followed with interest these reforms, also because other countries soon involved in similar programs, and most of them continued to this day (Wong, Hensher, 2018). It is also important to mention how, over the Thredbo series, almost a half of the experience was explicitly related to urban transport and a further 13% to non-urban, (Bray, Hensher, Wong, 2018, p. 28). A detailed analysis of the main topics discussed in the Thredbo Conferences goes beyond the scope of this paper, however several general and sectorial reviews are available online[5].

The review of past papers of the first thirty years of the Thredbo series on developments in public transport institutional reform, contract design and implementation follows a thematic and a historical approach (Wong, Hensher, 2018). Specifically, the analysis focuses on market arbitration, procurement mechanisms, asset ownership, contract design, risk allocation and contract management, and for each topic three eras of thinking reflect are illustrated (the *early ages*, 1989-1996, covering the first four conferences in Thredbo; the *turn of the century*, 1996-2006, including the next five conferences; the *recent developments*, 2006-2017, almost corresponding to the post-Global financial crisis) (*ibidem*).

While the analysis is exhaustive from a historical perspective, it seems to lack a geographical dimension, i.e. a discussion on how social and territorial contexts might affect decisions concerning the local transport

[4] https://www.legislation.gov.uk/ukpga/1985/67 (verified the 30th of June 2019).
[5] https://thredbo-conference-series.org/(verified the 30th of June 2019).

policies. Therefore, to complement the contents of the review of the Thredbo series, the literature overview focuses on the interdependence among geographical and socioeconomic factors, and the organization and the performances of local transport systems, with a specific attention posed to the analysis of the Italian context and of Rome's LPT.

At a general level of analysis, Williams *et al.* (2017) illustrates how land use zoning and urban sprawl imply an increased travel demand because people cannot work near their homes and cannot make use of local services and facilities. Instead, contained, compact, urban layouts, with a mix of uses in proximity, can

> provide population densities high enough to support public transport services and, to improved urban design, encourage cycling and walking. Variations on this model, with concentrations of high density developments around public transport nodes, or in local neighbourhoods within a city, are also advocated (*ibidem*, 1).

Specifically, the research coordinated by Williams explores three wide areas of interest:

- the extent to which spatial planning or the manipulation of urban form can contribute to sustainable mobility in the light of broader socioeconomic and cultural changes that, according to all transport indicators world-wide, are moving in the opposite direction;
- whether the compact form, as opposed to other urban layouts, is the most effective city form in terms of sustainable transport;
- the ability to implement substantial changes in urban development through spatial planning tools (*ibidem*).

Lying on the results achieved, Williams concludes that the urban form might have uneven impacts on different sectors of society, and, therefore, that «there is a need to know more about the interaction of urban form (for example density, size, topography, and road layouts) and socio-economic and cultural variables (for example household types, income levels, attitudes to travel behaviour)» (*ibidem*, 1).

Moreover,

> There is a need for practical advances in sustainable transport policy and implementation. Currently there is a lack of monitoring of the effectiveness of policies, and there are few detailed investigations into what works and what does not. There is undoubtedly a role for spatial planning in delivering sustainable urban transport, but currently information about what planners should do is not clear (*ibidem*, p. 1).

In brief, when designing, implementing and evaluating local public transport policies, while following the general trends in transportation economics identified in the international literature, it is important to achieve an adequate knowledge of the interplay between the urban form, socio-economic and cultural variables, and the effectiveness and efficiency of the local public transport.

Before focusing on Rome's local context it is important to create a bridge between the international debate and the analysis of the local context, by reviewing the main effects on the LPT sector of Italy's local public services reform initiated in the late Nineties.

ii) The Italian LPT sector after the local public services reform of Nineties. – The late Nineties local public services reform aimed at matching supply and demand and reducing costs of public utilities for local communities. The principles of the reform stated in the Legislative Decree (hereinafter, the L.D.) No.422/1997 (the so called, *Burlando Decree*), as modified by the L.D. No. 400/1999 and by the Law No.248/2006 (the so called *Bersani Decree*), were the following:

- separation of local public service regulations (attributed to Regions and local authorities) and operations (attributed to a special purpose company);
- service entrustment through public tendering procedures (so called competition "for" the market);
- local authority-providers relationship regulated by a service agreement (Tomassi F., Ugolini G., 2009, p. 71, Tomassi, 2012, p. 42).

Ten years after the *Burlando Decree*, however, only few Regions and local administrations had tendered out at least a share of the LPT services, and several incumbents had consolidated their monopolistic position.

Indeed, as allowed by the extension of the phase-out period, most Regions and local administrations opted either for direct entrustment to in house providers or for an invitation to tender for a private partner (so called *gara per socio privato*). Furthermore, most tendering procedures were awarded by publicly owned incumbents, seldom in partnership with private providers (Tomassi, 2008, p. 40).

The limited impact of the reform in the LPT sector has been associated with regulatory uncertainty and the lack of locally available financial resources[6] (*ibidem*), but the failure might have been caused also by deeper reasons, i.e. the latent conflict between the issue of cost-effectiveness legitimating more competition "for" and "in" the market on one hand, and the scale of production fostering a natural monopoly regime and the existence of public and common interests raising the need for state intervention on the other hand.

On the first issue, in Italy the LPT tariff policy is implemented by local public administrations, and specifically by Regional administrations, given that through fares they manage several policies, such as income redistribution and environmental policies (Vv. Aa., 2005, p. 20). Two systems, however, still coexist within the national legislation: the first one, established before 1997, delegates the Regional government to determine the suburban fares, and perimeters within Municipalities are entrusted to determine the urban fares; the second one, regulated by the *Burlando Decree*, determines that the identification of a general framework for tariff policy should be set in Regional Transport Plans, and fares in service agreements. (*ibidem*, p. 21).

Notwithstanding the legislative uncertainty, Regional administrations must follow two principles when setting fares: the first one concerns tariff integration and the second one prescribes that fare revenues must cover at least a 35% share of the operative costs. Furthermore, the implementation of an effective and efficient tariff system in the LPT sector contributes to incentivizing the use of public instead of private transport. Indeed, a comparison between fares and users' willingness-to-pay is a

[6] It is worth noting how financial transfers from the central to the regional and local administrations remained stationary for several years before increasing in nominal value less than input prices, and therefore partially lost their real value (Vv.Aa., 2006, p. 21). Consequently, financial constraints thwarted innovation and limited the interest of private firms in participating in public tendering.

measure of the relative competitiveness between public and private mobility.

Lying on these premise, it is worth to introduce the analysis of Rome's local context by reflecting on the data illustrated in Table 1, i.e. the overall amount of ATAC's revenues by territory (urban and regional transport) and travel pass (ticket, monthly pass, annual pass…). Apart from the inconsistency with respect to the operative and total costs (estimated, respectively, at EUR 849 million and EUR 1,100 million in 2016), the data show that the urban services are responsible for about 85% of revenues, while the regional services only provide an 11-12% share of revenues. Therefore, the data confirm the high dependency of Rome's LPT system on national transfers, but also the relative importance of ticket revenues with respect to monthly and annual passes, and the relative importance of urban fares with respect to suburban ones.

In brief, while on the one hand Rome's territory and socio-economic structure might negatively impact on the effectiveness of the local public transport system, on the other hand financial constraints might limit the space for designing and implementing ad hoc policies to better fit the local needs, alimenting a vicious circle.

Tab. 1 - *Breakdown of ATAC's Revenues*

	2015	2016
A. Ordinary tickets Rome	126,500,762	130,136,836
B. Monthly pass Rome	56,621,452	57,132,194
C. Annual pass Rome	37,565,901	42,261,166
METREBUS ROME (A+B+C)	*220,688,115*	*229,530,196*
D. Ticket Lazio	5,952,803	5,965,210
E. Monthly pass Lazio	14,067,189	13,931,461
F. Annual pass Lazio	11,590,636	9,268,632
G. Other Metrebus	-11,478	-22,710
METREBUS LAZIO (D+E+F+G)	*31,599,150*	*29,142,593*
H. Card èRome	208,964	213,399
METREBUS (ROME+LAZIO+H)	*252,496,229*	*258,886,188*
I. ATAC Network	8,213,848	5,959,473
OVERALL (METREBUS + I)	*260,710,077*	*264,845,661*

Source: Our elaboration on ATAC's 2015 and 2016 budget data

iii) A focus on Rome's territorial and socio-economic structure. – Paraphrasing Salvati (2015), discussing the case Rome, a Southern European capital city, might contribute to the international debate on transportation economics by providing hints to investigate the role of strategies promoting sustainable and efficient mobility in non-global cities. Indeed, while global city regions are leaders of the world urban hierarchy and engines of the global economy (*ibidem*), Rome is a Mediterranean city. The latter are

> hardly recognizable as global city regions. Located in-between north-western affluent cities and the developing agglomerations of the world 'south', the majority of Mediterranean cities is characterized by peculiar socioeconomic traits diverging from those observed in northern and western countries […]. Hyper-compact forms and dense settlements, poorly-organized public services, limited infrastructural networks […] and the 'vertical' class segregation are key attributes representing the history of these cities […]. These elements add to the traditional 'horizontal segregation' […] and to a 'popular land control' manifested through informal constructions, spontaneous settlements and a deregulated urban planning […] (*ibidem*, p. 73).

Indeed, Rome' s position in the main international rankings is relatively low and at most it can be considered a sub-global city, i.e. a city with stable population and performances based on some global services able to link the region or state into the world economy.

Moreover, according to Lelo, Monni and Tomassi (2019), Rome is a dual city, i.e. a city characterized by a sharp polarization of its territory and socio-economic structure. Indeed,

> in recent years centrally-located housing have become increasingly expensive, and are often targeted to a growing tourist market, or dedicated to luxury rentals, so that the city centre has undergone a generalized process of gentrification. In contrast, the weakest social groups – young couples, temporary workers, immigrants, separated and divorced individuals – move where affordable homes are located: in the outermost neighbourhoods beyond the GRA

> (Ring Road). These neighbourhoods are physically isolated, often surrounded by agricultural land or by "junkspace", and far from public services, institutional structures, and workplaces, with the exception of large shopping centres, which have arisen near or beyond the GRA in recent years (*ibidem*, p. 2).

The authors provide statistical evidence in support of Rome's sharp territorial divide and microfragmentation, and, among other things, suggest narrowing the existing territorial polarization «by way of investing today in order to see medium to long-term benefits, starting with infrastructure, and focusing in particular on rail transportation, for which adequate financing can be found, concentrating resources on a few incisive projects of overriding importance» (*ibidem*, p. 9).

The analysis of Rome's LPT system. – In this paragraph Rome's LPT system is analysed using an interdisciplinary perspective covering different time horizons (long, medium and short run), several scales of analysis (global, national and local) and several disciplines (history, political economy and economic geography), with the aim of identifying a strategy to trigger a process of resilient transformation of Rome's mobility toward sustainability.

i) The history of Rome's collective transport service. – Rome's collective transport service was inaugurated in 1845 and was publicly owned, but immediately after Italy's Unification, due to an increasing demand for a LPT service, several private firms got into the sector (Francescangeli, 2004). The first agreement between the Municipality of Rome and *Impresa Generale degli Omnibus* was signed in 1876, and by the beginning of the 20th Century, the public collective transport system managed by the firm, formerly known as *Società Romana degli Omnibus* (SRO) and *Società Romana Tramways e Omnibus* (SRTO), had already encompassed several omnibus lines and a mix of animal-drawn and electric-powered tramlines (Francescangeli, 2004; Di Pierantonio, 2017). Since the beginning of its operation, SRO has faced some sort of fare evasion (having a ticket was not mandatory), low productivity (especially regarding horse care, stable personnel and increasing traveling time), competition among vets, and regulatory issues concerning almost exclusive entrustment that deter-

mined *de facto* a monopolistic regime and consistent budget deficits (Di Pierantonio, 2017).

In 1909 the Mayor of Rome and his Officer for Technology founded the *Azienda Autonoma Tramvie Municipali* (ATM). During its first fifty years of operation, the ATM (formerly known as *Azienda Tramviaria del Governatorato* – ATG from 1926 to 1927, *Azienda Tramvie e Autobus del Governatorato* – ATAG from 1927 to 1945, *Azienda Tramvie e Autobus del Comune* – ATAC from 1944 onwards) faced several exogenous challenges related to the consequences of the First World War, a sharp increase in raw material prices during the Great Depression and, finally, a lack of human and energy resources, and infrastructural damages suffered during the Second World War. Notwithstanding the difficult territorial and political context, in the years between the two wars ATM achieved important goals, such as the implementation of an efficient tramline system. However, several mistakes were also made; for example when at the end of the Twenties, ATAG, at its own expense, felt consequences of eliminating the tramlines from the urban center: the price for the service rose sharply for citizens and the company lost efficiency due to new petrol-powered buses[7].

After the Second World War, the LPT system was progressively restored by ATAC and during the Sixties the company was part of a national economic boom. However, at the end of the Sixties, Rome only had less than ten kilometers of underground lines, and an obsolete, badly maintained and reduced in size tramway line, while ATAC suffered high personnel and operating costs. In this scenario, the local administration failed to achieve the goal of merging all the existing firms in a sole publicly managed company in order to achieve economies of scale and cut costs. At the beginning of the new Millennium, ATAC was turned into an agency and two new companies were founded (Trambus and Met.Ro.) to manage the fleet.

[7] A detailed analysis of the history of Rome's local transport system since the First World War goes beyond the scope of this research, therefore the synthesis provided in the following mainly refers to the information collected on the ATAC website at http://www.atac.roma.it/page.asp?p=52 (verified the 30th of June 2019), and on the Municipality of Rome website https://www.comune.roma.it/pcr/it/newsview.page?contentId=NEW155491 (verified the 30th of June 2019).

ii) The rise of the LPT's Roman model. – Since the closure of the National Transport Fund in the late Nineties, the Lazio Region obtained a reduced amount of funds for improvements of the LPT system. As the regional and local public transport system ran deficits to finance its operations, the Municipality of Rome accumulated consistent debt and therefore was forced to innovate the governance of the sector (Vv.Aa., 2005, p.16). The new Roman model of public transportation followed two principles:

- separation of the programming activities from the service regulation and management;
- progressive liberalization of the operations through public competitive tenders (Vv. Aa., 2004, p. 31).

The Roman model initially consisted of a governing body (ATAC), in charge of negotiating service agreements with several providers, and *Società Trasporti Automobilistici S.p.A.* (STA), entrusted for research and development aimed at urban mobility. Specifically, the LPT providers were:

- Trambus, entrusted with tramlines operations and maintenance of the rolling stock and ATAC's property;
- *Metropolitana di Roma S.p.A.* (Met.Ro.), entrusted with the underground railway and three suburban railways operations;
- other temporary joint ventures under *Sicurezza Trasporti Autolinee S.p.A.* (SITA) in charge of the peripheral local transport services.

A bundle of service agreements defined the governance framework between the Municipality of Rome and the LPT service providers, while ATAC oversaw the management of the internal financial flows (*ibidem*).

The Roman model had been continuously reformed and ten years after its foundation its structure resulted profoundly changed. ATAC was entrusted with 80% of the surface LPT and the whole underground railway by a bilateral service agreement signed between the Municipality of Rome and the Rome Mobility Agency, and by two trilateral agreements between the Municipality of Rome, ATAC and, respectively, Met.Ro and Trambus. The remaining 20% share of the surface LPT was assigned to the *Tevere Consortium* (lately evolved into Rome LPT s.c.a.r.l.). The Lazio Region, on the other hand, was entrusted with the three railways managed by Met.Ro, the suburban road transport lines managed by *Compagnia Trasporti laziali S.p.A.* (Co.Tra.L.), owned jointly by the Lazio Region and the Province of Rome, and the regional railways managed by

Trenitalia (Tomassi, Ugolini, 2009, pp. 76-79).

The Metrebus consortium introduced a single ticket or pass giving simultaneous access to all the existing LPT urban and suburban lines in Lazio and shared the revenues among the numerous providers according to predefined quotas. ATAC also managed several private mobility services, such as the ZTLs (limited traffic zones), the licences for touristic coaches, toll parking lots, exchange car parks, car sharing and bike sharing. Finally, Trambus managed several private transport services, such as vehicles rental and Trambus Open touristic services, that provided additional non-tariff revenues fostering sustainability of the LPT system (*ibidem*, p. 77).

In brief, during the first ten years of operations, the Roman model lacked an integrated management system for the numerous LPT road and rail transport lines, and an integrated plan at the provincial and metropolitan scale. The Municipality of Rome therefore in 2009 adopted a new industrial plan that:

- introduced a new incentive scheme into the service agreements based on the number of users and observed increase in revenues;
- established a new company (the New ATAC) by integrating ATAC's commercial and ancillary activities with Trambus and Met.Ro operations, and setting new targets in terms of costs, revenues and quality;
- transformed the remaining of ATAC into an agency controlled by the Municipality of Rome (*Rome Mobility Services S.r.l.*, hereinafter, the RMS) in charge of supporting Department's mobility and transport, and managing service agreements and tendering procedures;
- unbundled *ATAC Patrimonio* from ATAC and relocated it to the Municipality of Rome (*ibidem*, pp. 77-78).

iii) A focus on taxis and NCCs. – The local transport system operated by the Municipality of Rome encompasses the public and private transport systems, and they both contribute to the level of accessibility and interconnection of the city. As part of the already mentioned LPT system (including buses, tramlines, underground surface railways), the means of public and private transport include:

- private vehicles with licenses or public permits, i.e. taxis and a car hire service with driver (NCC);
- a regulation system for individual private transport, including incen-

tives and penalty schemes in support of soft (and less polluting) mobility, i.e. walking and cycling modes;
- several dedicated services for specific targets, i.e. transport services for disabled people and school transport for children (Tomassi, 2012, p. 41).

The first category deserves further analysis. Taxis are of public benefit, as they contribute to reducing the number of private vehicles in use and they allow for more timely transport services. Consequently, a regulation on non-scheduled public transport should introduce several public transport obligations for taxis to foster the continuity and universality of the service, and its maximum territorial coverage[8].

In Rome, on the other hand, the regulation has always evolved through consultation and agreements with taxi drivers' lobbies, and that has obstructed innovation for a long time. The number of licenses reached a reasonable level only after 2004, when 450 new taxis were introduced. After the *Bersani Decree*, the Municipality of Rome incremented the supply by emitting another 1250 licenses. However, after the innovations introduced by the *Bersani Decree*, the sector stagnated for several years, at least until the introduction of the new Municipal Regulation on taxis in 2011 (*ibidem*, p. 68).

iv) Local demand for mobility services. – The recent urban sprawl of Rome, mainly related to the new low-density settlements built outside the Rome's beltway, is incentivizing ownership and the use of private transport, as it has been shown to be more effective in narrowing the existing spatial gap between new peripheries and central places. Indeed, the distance between origins (dwellings) and destinations (workplaces, schools, parks, etc.) is increasing, and the inadequacy of the road system to satisfy the needs of the new urban areas make the LPT slower and less timely, raising the costs for the community and increasing the urban territorial and socio-economic polarization. Also, the level of safety for pedestrians (especially for vulnerable categories) and cyclists is decreasing,

[8] In Italy Regulation guidelines are prescribed by the Law No. 21/1992, which introduces a distinction between taxis and NCC, and sets the public transport obligations for the former while allowing the latter to negotiate freely on the market. Since 1992, the national regulation has been modified by a constitutional reform of the Title V, the *Bersani Decree* and by the L.D. No.1/2012 (the so called *Cresci Italia*).

as sidewalks and pedestrian crossings are often inadequate (Tomassi, 2012).

Even though the economic crisis and the rise of oil prices reduced the demand for local transport services, neither the high private mobility costs nor the economic effect of the global financial crisis have reduced the pivotal role of cars among transport means. Like most urban areas, Rome is also characterized by a comparatively low share of private vehicular transport. However, it reaches a 55% share, leaving the LPT with a 16% share out of the total demand. Furthermore, most movements do not exceed the municipal borders. That means that the LPT system suffers a lack of demand, which might impede the achievement of scale economies. This circumstance might have been at least partially mitigated by introducing intermodal transport in peripheral areas aimed at catalyzing workers and students toward the major transport network nodes. Furthermore, almost half of the movements registered in Rome have a limited length, therefore empowering soft mobility could at least partially reduce the hyper congestion (*ibidem*).

v) Compliance of the LPT system with norms of local transport plans. – Due to the complexity of the territory of Rome, the local governance of urban mobility needs outstanding design, regulation and policy integration (Tomassi, 2012, p.39). However, the regulative framework is still fragmented and stratified, and local mobility policies have been influenced for several years by the governmental appointment of the Mayor of Rome in 2006 as Commissioner-Delegate for the implementation of emergency measures in traffic (*ibidem*, p.40). Finally, strategic and operative plans are often not integrated and therefore the LPT system is not designed in accordance with the estimates of the actual mobility flows, determining a mismatch between the volumes of services demanded and supplied.

Specifically, the national regulation introduces three urban mobility plans involving both the public and private transport (the so called PUT – *Plan on Urban Traffic* –, PUP – *Plan on Urban Parking* – and PUM – *Plan on Urban Mobility*) and the Municipalities must oversee their design.

The PUT must be updated every two years, and in Rome it has been articulated into three classes of documents:

- General Plan on Urban Traffic (PGTU, or *Piano generale del traffico ur-*

bano) which provides a general overview of the urban mobility and sets a framework for local action;
- Detailed Plans for Urban Traffic (PPTU, or *Piano particolareggiato del traffico urbano*), that manage more specific issues, such as road safety, pedestrian mobility, traffic flows optimization, road regulation, major refurbishments, etc.;
- Implementation Plan for Urban Traffic (PETU, or *Piano esecutivo del traffico urbano*), which turns issues emerged in PPTUs into executive projects (Galiano, 2015, p.240).

The PUP should be updated every three years, but the initial 1989-1991 plan was updated only in 2006-2008, and a debate is still ongoing on a new PUP that the Municipality of Rome should design. However, both versions have been regularly updated with information about newly implemented projects.

Finally, the PUM has never been published. A *Strategic Plan for Sustainable Mobility* (PSMS) was published instead of it in 2009. The PSMS is now obsolete and will be soon replaced by a *Sustainable Urban Mobility Plan* (PUMS) that will define the infrastructure for mobility services and will develop a vision for urban mobility.

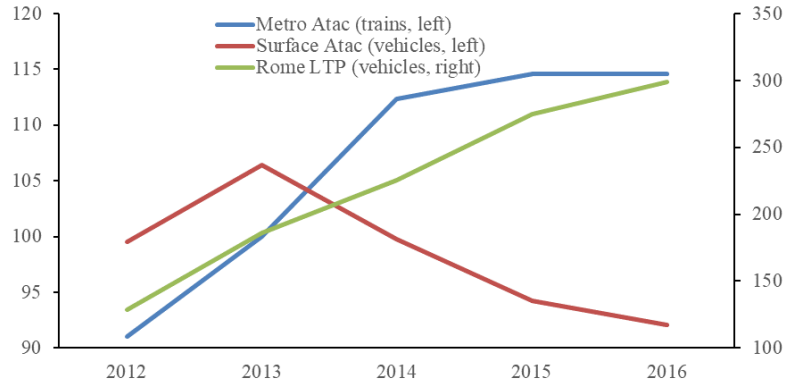
vi) A summary. – The historical overview illustrates that the debate on the organizational structure of the LPT system (public vs private ownership, market regime and competitiveness) is still ongoing. History seems to suggest that sound LPT policies should focus on the achieving an optimal mix of market and state intervention rather than fostering corner solutions involving either market or state intervention.

The analysis also indicated several potential causes of the (at least partial) failure of the liberalization processes initiated at the end of Nineties and highlighted that many of them are probably still active. Also, notwithstanding the additional costs paid by the community due to the widely documented inefficiencies of the local LPT providers, there is evidence that consistent efficiency gains might be achieved by increasing the cooperation with private actors, by updating and integrating the urban mobility plans, and by modifying the LPT system accordingly.

Statistical overview of Rome's LPT system. – The new website of the Municipality of Rome provides summary statistics on urban and suburban mobility, and their analysis provides interesting hints on most of the issues discussed in the previous paragraph[9]. Indeed, the ASPL annual reports 2003-2016 present and comment on a wider array of data on performances of Rome's LPT system, but each report discusses the data collected on a limited time horizon, and a reconstruction of a full-length time series would go beyond the scope of this paper. Furthermore, it seems that, despite the increasing amount of data presented, a more in-depth analysis would be needed to identify the most relevant and exhaustive data and the scale at which the assumption of homogeneity is realistic in order to cope with the already mentioned territorial heterogeneity.

i) A focus on ATAC's fleet. – Figure 2 illustrates how the number of vehicles in ATAC decreased between 2012 and 2016 (-8.0%), whereas the number of trains in ATAC and vehicles in Rome's LPT system increased sharply (14.6% and 298.8% respectively).

Fig. 2 - *ATAC and Rome LPT trains and vehicles (2011 = 100)*



Source: our elaboration on RMS data

[9] Data have been downloaded at the following address: https://www.comune.roma.it/web/it/roma-statistica-mobilita.page (verified the 30th of June 2019). Most of the data presented in the remainder of the paragraph have been commented also in Vv.Aa., 2017. The interpretation, however, partially diverges, due to the different purpose of the analysis.

As new vehicles in Rome's LPT system overcame the number of dismissed vehicles in ATAC (318 vs 118) and 13 new trains were available, it seems that, even if the average age of the fleet remained high, some renewal was made, and some qualitative increment was achieved. Considering also the reduced number of users, the quantitative matching between the demand and supply of the LPT services may have improved but more in-depth analysis is needed to test this hypothesis.

Going more in depth in the analysis of the LTP inputs, Table 2 provides a breakdown of data on vehicles and trains. It can be noticed that:

- buses are the most commonly used vehicles for surface transport;
- most of the available trains are employed in metro line A;
- trains apart, Metro is endowed with a consistent number of vehicles;
- the number of buses in Rome's LPT system is increasing.

Tab. 2 - *Number and average age of ATAC and Rome LPT vehicles by line*

	2015		2016	
	no.	av. age	no.	av. age
A. Buses	2,055	10.2	2,011	10.7
B. Trams	164	32.2	164	32.5
C. Buses managed by Rome LPT	8	17.1	0	-
ATAC surface (A+B+C)	*2,227*	*11.8*	*2,175*	*12.3*
D. Line A (trains)	39	11.0	39	11.0
E. Line B (trains)	50	17.6	50	17.4
F. Line C (trains)	13	2.0	13	4.5
Metro (trains) (D+E+F)	*102*	*13.2*	*102*	*13.3*
G. Metro (vehicles)	640	13.2	612	13.3
Sum of ATAC vehicles (A+B+C+G)	*2,867*	*12.1*	*2,787*	*12.6*
Rome LPT buses	440	-	478	4.0

Source: our elaboration on ATAC – RMS data

Furthermore, the data confirm that the average age of public transport vehicles is generally high (Line C trains and vehicles in Rome's LPT excluded), especially considering trams (32.2 years on average) and line B trains (17.4 years on average[10]), even if on average the age of

[10] According to a 2016 ASSTRA bulletin, in Italy the average age of buses was 12.2 years in 2016, while in Germany, France, UF, and Spain was far below 10 years of age

ATAC's fleet is not that high according to Italian standards.

Figure 3 provides a breakdown of ATAC's fleet by the status of vehicles, illustrating how a consistent part of the available stock was withheld due to incidents, malfunctioning and maintenance (about 40% of surface vehicles and less than 20% of metro vehicles). Therefore, the share of used vehicles in both surface and underground transport during 2015 and 2016 was almost 50%.

Fig. 3 - *Breakdown of ATAC vehicles (number, average annual data)*

Source: our elaboration on ATAC's data

(data available at http://www.asstra.it/stampa/visualizza_comunicato_stampa/archivio-2016/emergenza-trasporto-pubblico-locale---autobus-vecchi-da-rottamare--allanno-per--anni.html, verified the 30th of June 2019).

In brief, the analysis of the physical inputs employed in the production process highlights the relevance of road over railway transport at least in the programmed supply of the LPT services. Furthermore, it is evident that the chronical obsolescence of the fleet, even if comparable to Italian standards, has grown rapidly in the last ten years (according to Repubblica, it was 6.4 years in 2006[11]) instead of converging to the average age of eight years indicated in the national sectorial plan[12]. Finally, the data highlight a consistent share of withheld vehicles in ATAC, and this evidence has been often associated (only) to the obsolescence of the fleet. However, during the last two years 54 of their vehicles caught on fire while in service, and it seems that a major cause of fires could have been omissions of cleaning maintenance and shocks induced by bad conditions of the road system on electric components of the vehicles.

Indeed, it is worth noting how that the number of vehicles and trains approximates the amount of physical inputs employed, and not the output produced (i.e. transport services). Furthermore, quantitative improvements on the supply side do not necessarily determine improvement in service quality. Indeed, the regional and local territory are not undifferentiated spaces, and distances may have grown up faster than the number of vehicles and trains owned by ATAC due to an uncontrolled urban expansion. Therefore, the overall increase in the number of vehicles and trains should only be considered as an indicator of the amount of physical input employed in the production process, but neither as an indicator of the level of output produced nor of the outcomes achieved.

ii) A focus on ATAC's services. – In 2016, ATAC's vehicles served almost 250 lines of the 353 bus lines programmed (the remaining 103 lines were managed by Rome's LPT system). Furthermore, the LPT system consisted of four metro lines and six tramlines. In the same year, the surface LPT system had a length of 2,279 km and 8,463 stops (there were 30 km more and almost a hundred stop less in 2015). On the other hand, the underground LPT system had been extended since 2011 due to the

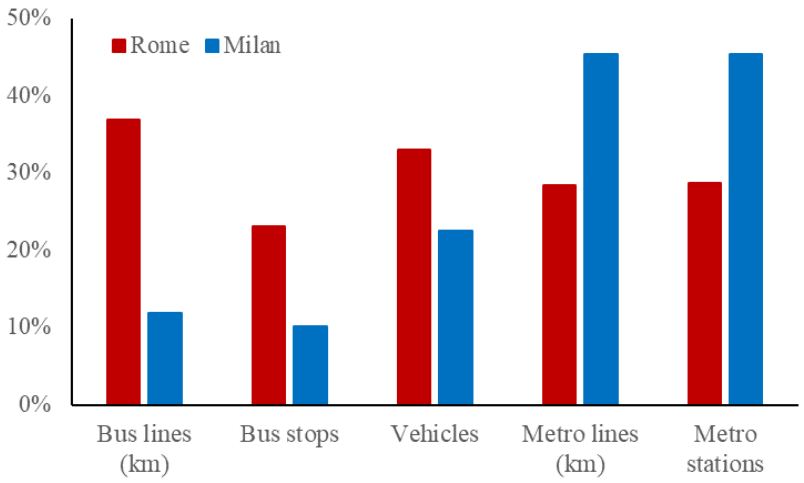
[11] http://lab.gedidigital.it/repubblica/2018/cronaca/bus-incendi/ (verified the 30th of June 2019).

[12] www.asstra.it/stampa/visualizza_comunicato_stampa/archivio-2016/emergenza-trasporto-pubblico-locale---autobus-vecchi-da-rottamare (verified the 30th of June 2019).

implementation of Line C and reached a length of 58.0 km in 2016 (only 37.0 km in 2011).

These data are remarkable when compared with national figures and might highlight other sources of structural inefficiencies often neglected in the institutional and academic literature. A 2013 screening presented by Galiano (2015, p. 192) can be used to discuss the enormous importance of Rome's LPT system at national level with respect to Milan, i.e. the most quoted (and relevant) benchmark in terms of efficiency. It emerges that Rome's LPT system was in 2013 three times bigger than Milan's (37% vs 12% of the national bus lines as measured in km), but it had only 2.3 bus stops for every bus stop in Milan (23% vs 10% of the national bus stops) and less than 1.5 vehicles (33% vs 23% of the national overall number of vehicles). Furthermore, in 2013, both the length of the underground line and the number of metro stations were smaller in Rome than in Milan. If scale economies and availability of railway infrastructure play roles in determining the efficiency of the LPT, this data should be kept in mind when measuring the inefficiency of the Rome's LPT system.

Fig. 4 - *Relevance of Rome and Milan LPT systems at national level (%)*



Source: our elaboration on 2013 ISTAT data illustrated in Galiano (2015, p. 192)

Given this general background scenario, it is worth mentioning that, in the period 2011-2016, the Rome's LPT system on a yearly basis accounted for more than 90% of the production level indicated in the service agreements. The actual-programmed-production ratio, however, was slightly decreasing (except in 2014) and exhibited some degree of heterogeneity. On average, ATAC resulted less efficient than Rome's LPT system, and, when it comes to ATAC's transport means, the efficiency of metros was continuously decreasing over the given period.

Tab. 3 - *Yearly actual vs programmed production ratio (vehicles-km)*

Provider	ATAC				Rome LPT	All
Service	Bus and tram	Railway	Metro	Overall	Surface	
2011	91.8%	91.7%	96.3%	92.7%	99.2%	93.6%
2012	93.5%	95.2%	90.1%	92.8%	99.5%	93.8%
2013	89.1%	92.7%	95.9%	91.2%	98.2%	92.2%
2014	95.6%	95.7%	91.9%	94.6%	97.2%	95.0%
2015	92.5%	87.6%	83.3%	89.3%	96.7%	90.4%
2016	87.3%	94.3%	88.8%	88.4%	97.0%	89.8%

Source: our elaboration on RMS Data

A higher heterogeneity emerges, however, by monthly data for 2016. Recalling that 2016 was characterized by the lowest aggregate efficiency observed (89.8%), ATAC metro exhibited its peak of inefficiency in June, which was far below the average (79.8% of production, ten percentage points below the average), while ATAC's surface transport system exhibited a decreasing efficiency from January to October, reaching a level of 81.3%). On the other hand, the actual production of Rome's LPT system was close to the programmed one. In brief, it seems that the lack of efficiency might be of punctual rather than sectorial nature, and therefore more disaggregated data should be necessary to identify the bottlenecks that thwart the overall efficiency of Rome's LPT system, and especially ATAC's one.

Tab. 4 - *Monthly actual vs programmed production ratio (vehicles-km, 2016)*

Company	*ATAC*		*Rome LPT*
Service	*Metro*	*Surface*	*Surface*
Jan	85.8%	92.7%	99.1%
Feb	89.1%	92.1%	99.6%
Mar	89.2%	92.5%	98.5%
Apr	89.1%	91.9%	95.0%
May	88.9%	91.0%	89.0%
Jun	79.8%	87.7%	99.2%
Jul	87.8%	83.3%	96.7%
Aug	94.2%	85.0%	98.1%
Sep	90.3%	81.3%	99.1%
Oct	90.4%	81.3%	98.0%
Nov	89.2%	82.3%	96.0%
Dec	92.0%	86.2%	95.9%
Overall	*88.8%*	*87.3%*	*97.0%*

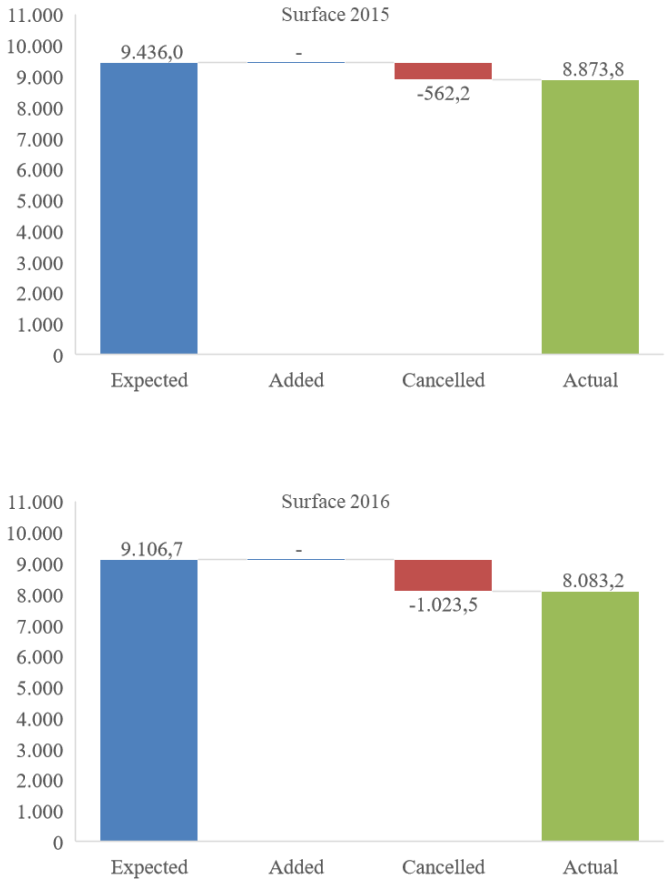
Source: our elaboration on RMS data

Similar results are obtained by adopting a different perspective. Figure 5 and 6 illustrate the overall number of metro and surface travels registered in 2015 and 2016. It can be noted how for the surface transport the share of cancelled over the expected travels was not high but increasing (from 6.0% in 2015 to 11.2% in 2016), while it was consistent and decreasing for metro (from 18.6% in 2015 to 15.3 in 2016) and partially compensated by additional travels. In brief, in 2015, 84.2% of metro travels and 94.0% of surface travels were provided, while in 2016 the percentage turned, respectively, into 87.1% and 88.7%.

It is worth mentioning that in 2015 most of the cancelled metro services were annulled due to lack of personnel and rescheduling on Line A and B, while most of the cancelled surface services were annulled due to malfunctioning of vehicles and exogenous causes (strikes, roadworks, detours…). In 2016, rescheduling on Line A was more efficient, but, apart from the lack of personnel, the lack of materials also affected both Lines A and C, while the causes of the surface services' cancelations were almost the same. It's obvious, therefore, that the endogenous sources of inefficiency (rescheduling, lack of personnel and resources) are only one

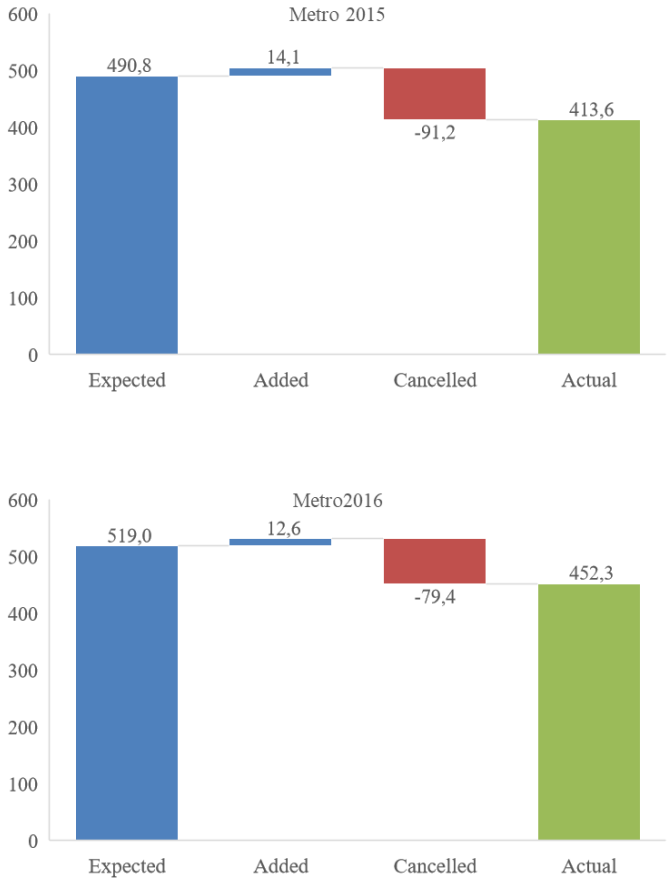
part of the main sources of inefficiency, given that another part of inefficiency is, as already indicated, "imported" by the territory. That might contribute to explaining the scarce turnover of the fleet, as, due to the exogenous causes of malfunctioning, it might be more efficient to invest in maintenance rather than in new vehicles and trains, as the latter might frequently face incidents and other causes of malfunctioning.

Fig. 5 - *ATAC: breakdown of surface travels (thousands)*



Source: our elaboration on ATAC data

Fig. 6 - *ATAC: breakdown of metro travels (thousands)*

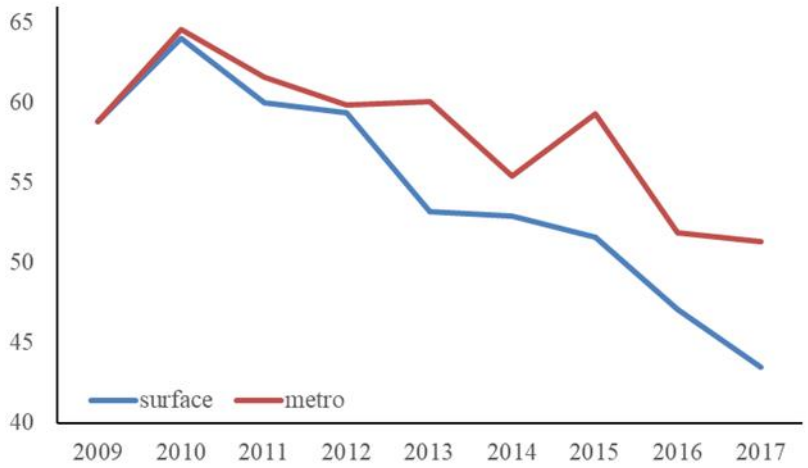


Source: our elaboration on ATAC data

Finally, the ASPL provides data on the observed quality of service obtained by computing three Consumer Satisfaction Indexes (CSI): an implicit CSI, an ex-ante CSI and an aware CSI. The implicit CSI, computed as a weighted average of users' partial assessments, dominates the others, i.e. assumes higher values for all years, and therefore the observed quality might be lower. The data highlight that the quality of both surface and metro services has been deteriorating since 2010, but the quality of surface services has become insufficient since 2013, while the quality of metro services has become insufficient since 2016. Therefore, attention

should be paid to a qualitative shirking that might have at least partially attenuated the actual quantitative inefficiency. Furthermore, service quality deterioration might be the most important cause of users' overreaction, if compared to the Rome's LPT system's quantitative performance, in terms of perceived inefficiency of the service. This is especially true if we take into consideration that according to the RMS data, the main qualitative standards that have not been respected since 2011 concern signals and internal and external cleaning. Once again, more disaggregated data are needed to provide empirical evidence in support of this hypothesis.

Fig. 7 - *Implicit CSI for surface and metro services*

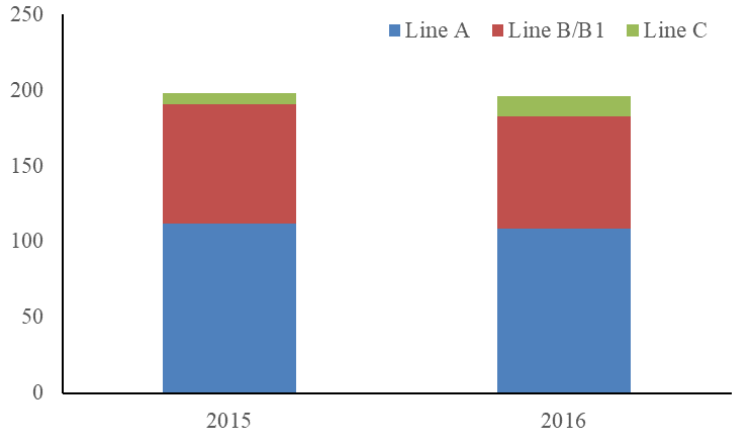


Source: our elaboration on RMS data (2018)

iii) A focus on LPT users. – The last part of this preliminary statistical analysis is focused on data collected on users and revenues of Rome's LPT system. Figures 8 and 9 illustrate the number of authenticated tickets by metro line and station in 2015 and 2016. It can be noted that the number of authenticated tickets slightly decreased from 198.3 to 196.3 million (-1%). However, the number of tickets authenticated on Line C increased sharply from 7.4 to 13.3 million (+74.2%), probably "cannibalizing" part of the users and revenues of the other two lines. Neverthe-

less, if the authenticated tickets are a reliable proxy for the number of users, Line A is by far the most used Rome's metro line (its users validated more than 55% of the authenticated tickets in both years), followed by Line B (35-40% share of tickets in both years). This evidence might suggest that the new Line C is still far from deploying its full impact both on traffic and on the use of surface LPT, probably because users are still getting to know their new mobility choices.

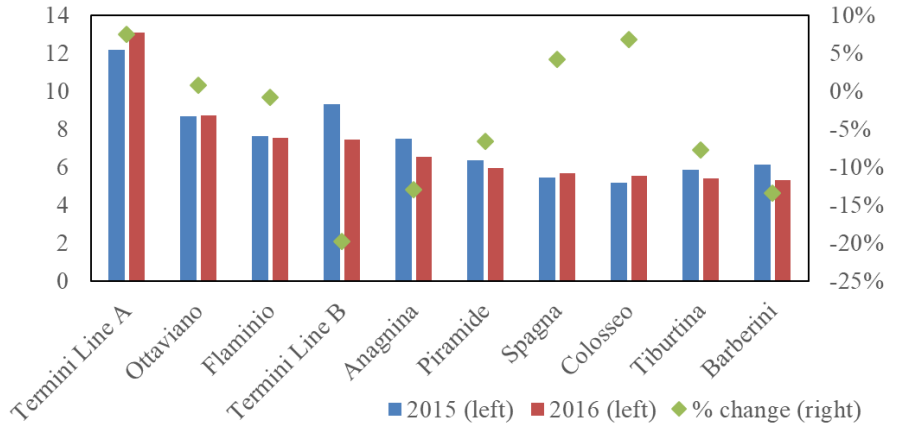
Fig. 8 - *Number of authenticated tickets by metro line (millions)*



Source: our elaboration on ATAC data

Concerning the analysis of authenticated tickets by metro station, the absolute and comparative importance of Termini is evident with respect to all other metro stations. Indeed, considering the overall traffic on Line A and Line B, more than 20 million tickets were validated at Termini (more than 10% of the total). Only 16 out of 74 metro stations own a ticket share between 5 and 2% (overall, they own a 50% share of tickets in both years), while all the remaining metro stations own a lesser than 2% share. This suggests that the high concentration of travels might be an important determinant of the perceived ineffectiveness and inefficiency of Rome's LPT system.

Fig. 9 - *Rome's most relevant metro stations by number of authenticated tickets in 2015 and 2016 (millions)*



Source: our elaboration on ATAC data

Concluding remarks. – The research presented in this paper aims at putting an analysis of the major issues animating the long run debate on Rome's LPT system into a unique framework, and highlighting the major causes of inefficiency and ineffectiveness of the services provided, in order to contribute to the improvement of Rome's LPT service.

The brief overview of the history of ATAC highlights the longstanding nature of the public vs private ownership debate, the market regime debate and the debate on the efficiency and effectiveness of the services provided by firms operating in this sector. The overview is also far from having reached a conclusion. It also reveals how some beliefs are nowadays deeply rooted in the background of the LPT operators (i.e., the importance of a well-developed rail transport system to reduce congestion; the need for state intervention, at least in terms of regulation, due to the nature of the service provided; the risk of low productivity and persistent deficits, and competition with private transport service providers; the need for more competition "for" and "in" the market). Therefore, history seems to suggest that sound LPT policies should focus on the achieving an optimal mix of market and state intervention rather than fostering corner solutions involving either the market or the state.

Second, the institutional literature surveyed, being mostly related to the ASPL monitoring activity, intrinsically provided evidence of the fundamental role played by local agencies in monitoring the management of

the locally provided services of general interest. Furthermore, the institutional literature highlighted how the existing market failures cannot be neglected, nor can the defensive strategies adopted by several LPT providers (Danovi, Karletsos, 2011), including ATAC, to avoid the competition with the international providers despite the inefficiency of the service provided and therefore of the additional costs inflicted to the community.

On the other hand, consistent efficiency gains might be achieved by updating and integrating the urban mobility plans, and by modifying the LPT system (both production and pricing) to better match users' needs. Furthermore, social and technological innovation (i.e., soft mobility and empowerment of satellite monitoring systems), if properly incentivized, might foster additional efficiency gains, creating ex-ante conditions for more competition "for" the market. Indeed, an important issue is that even if liberalization might enter a new "golden age", the existence of local structural inefficiencies might reduce the margins needed to motivate private providers to enter in the market, at least in those production segments more related to public interests (i.e., serving peripheral and hyper congested areas without charging users for inefficiencies through higher tariffs…).

Finally, the analysis of the summary statistics collected by the Municipality of Rome allowed some evidence on specific issues of interest. First, it seemed that, even if the average age of ATAC's fleet is high, some renewals were made, and some qualitative increment was achieved between 2012 and 2016. Second, it is worth noting that, when monitoring the amount of ATAC's physical input, the number of vehicles and trains and their maintenance should be considered only as a proxy for the stock of physical capital, not as an indicator of the level of output produced, nor of the outcomes achieved. Third, the evidence built on a screening exercise recently published (Galiano, 2015, p.192) illustrate that the bus lines of Rome's LPT system are almost three times longer than Milan's, but they are covered by less than 1.5 vehicles for every Milan's bus in a local scenario characterized by a comparatively underdeveloped underground railway system. As scale economies and the availability of railway infrastructures play roles in determining the efficiency of the LPT system, this evidence of "structural inefficiency" should be considered when the performances of Rome's LPT system are measured.

Fourth, attention should be paid to the decreasing trends in customer satisfaction, as the deterioration of service quality might have determined the sharp fall observed after 2011 in the aggregate demand for public transport services, contributing to the increase of ATAC's budget deficits above the expectations. Fifth, the data highlight Termini's importance with respect to all other metro stations in Rome, suggesting that the mix of the high concentration of users on specific LPT network's nodes and some residual homogeneity in the provision of transport services might be an important determinant of the scarce performances of Rome's LPT system.

To conclude, the results of the research highlight that ATAC's inefficiency is only partially endogenous, and that the "imported" territorial (both physical and social) inefficiency is not negligible. This issue deserves more attention as, even if liberalization processes might enter a new "golden age", the existence of local social and territorial imbalances might reduce the margins needed to induce private providers to enter the market, at least in those production segments more related to public interests, undermining every strategy aimed at making Rome's LPT system more effective, efficient and sustainable.

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Rome's Local Public Transport System: How to Trigger a Resilient Transformation Toward Sustainability? – The research presented in this paper contributes to the ongoing debate on the public vs private ownership by re-examining the case of Rome's local public transport (LPT) system. After having illustrated the main reasons that led Rome's citizens to ask for a referendum, the research provides a brief historical overview of Rome's

LPT system and discusses the main stylized facts presented in the institutional literature surveyed. Finally, the summary statistics are built using publicly available data. The results of the analysis highlight how ATAC's inefficiency is only partially endogenous, as the "imported" territorial inefficiency is not negligible. This issue deserves more attention as, even if liberalization might enter a new golden age, the existence of structural inefficiencies might reduce the margins needed to incentivize private providers to enter the market, at least in those production segments more related to public interests.

Keywords. – Local Public Transport, Public vs Private Ownership, Imported Inefficiency

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