CiVITAS FORUM 2015
CIVITAS ANNUAL CONFERENCE | 7-9 OCTOBER 2015 | LJUBLJANA

Session 1: How new trends in bike-sharing can change your city

DESIGNING A BIKE SHARING SYSTEM.

THE MILAN CASE

7/10/2015

Ljubljana

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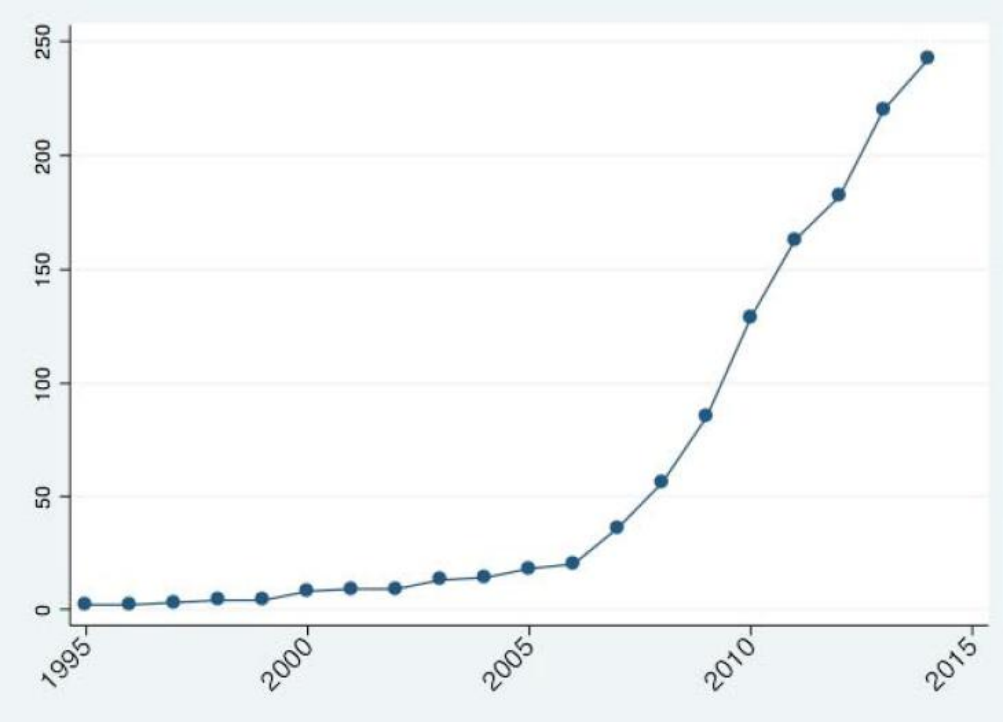
Bike sharing systems at world scale

- Bike sharing systems are **rapidly growing** worldwide; Countries with the highest number of programs are **Spain** (132), **Italy** (104) and **China** (79);

EVOLUTION OF SERVICE

- **First generation** (bikes for public use with no charge and no tracking)
- **Second generation** (bikes collected and returned to specific points through a deposit)
- **Third generation** (magnetic cards, integration with smartphone, more flexibility in both fixed stations and free floating models) – *first large program in Lyon in 2005*

Third generation systems generate **new data** to be studied.



Number of Bike sharing systems at world scale.
Source: IEFE-Bocconi University elaboration

Bike sharing literature: research background

- Literature on bike sharing concentrates on social and behavioural aspects. **Spatial drivers** have been scarcely considered and mainly in the phase of system design;
- Choices on models, usage rules, features of bikes, number of stations, number of bikes per station, distribution of stations on a territory in terms of distance and positioning are usually made through **ex-ante analysis** in the **absence of consolidated models**;
- **Ex-post** evaluation studies are scarce;
- Evidences on the **success factors** of bike sharing is limited.

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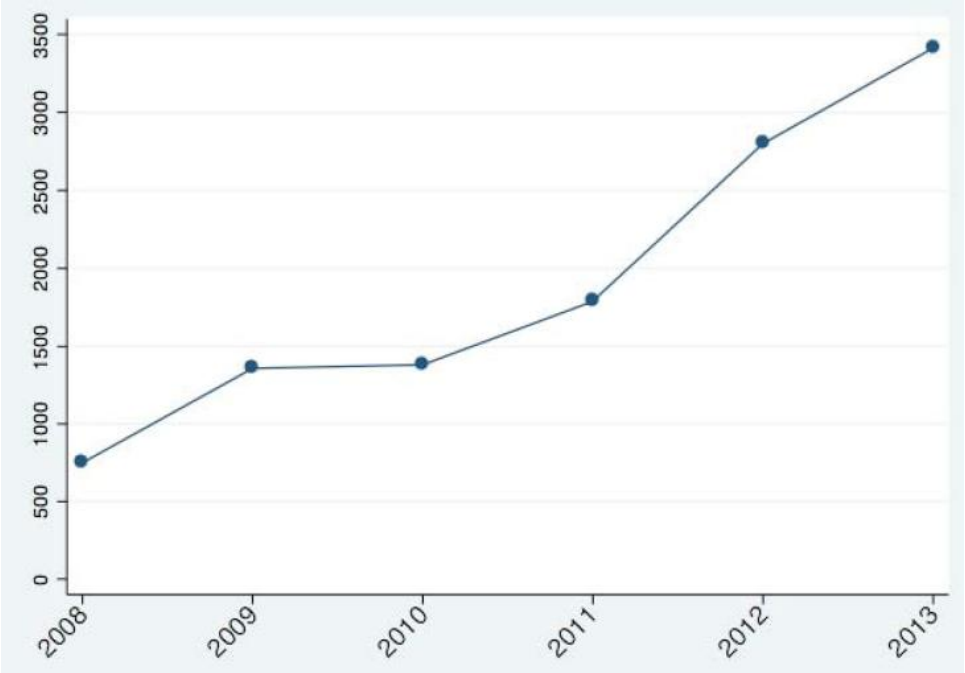
Milan bike sharing system description

- **“BikeMi"** was introduced in December **2008 in connection with urban road pricing**;
- It is a **public service** available 7 a.m. to 12 p,m, 7/365;
- 2 phases: 1) **2008-2009** with stations only in city center and 2) **2011-2013** with service extended to semi-central areas;
- The system reached **255 stations** and **3.600 bikes** with **3 mil travels** in 2015;
- The system is still under evolution. In 2015 (in occasion of Milan EXPO 2015) **1.000 electric bikes** were added. **Baby bikes** are being placed.

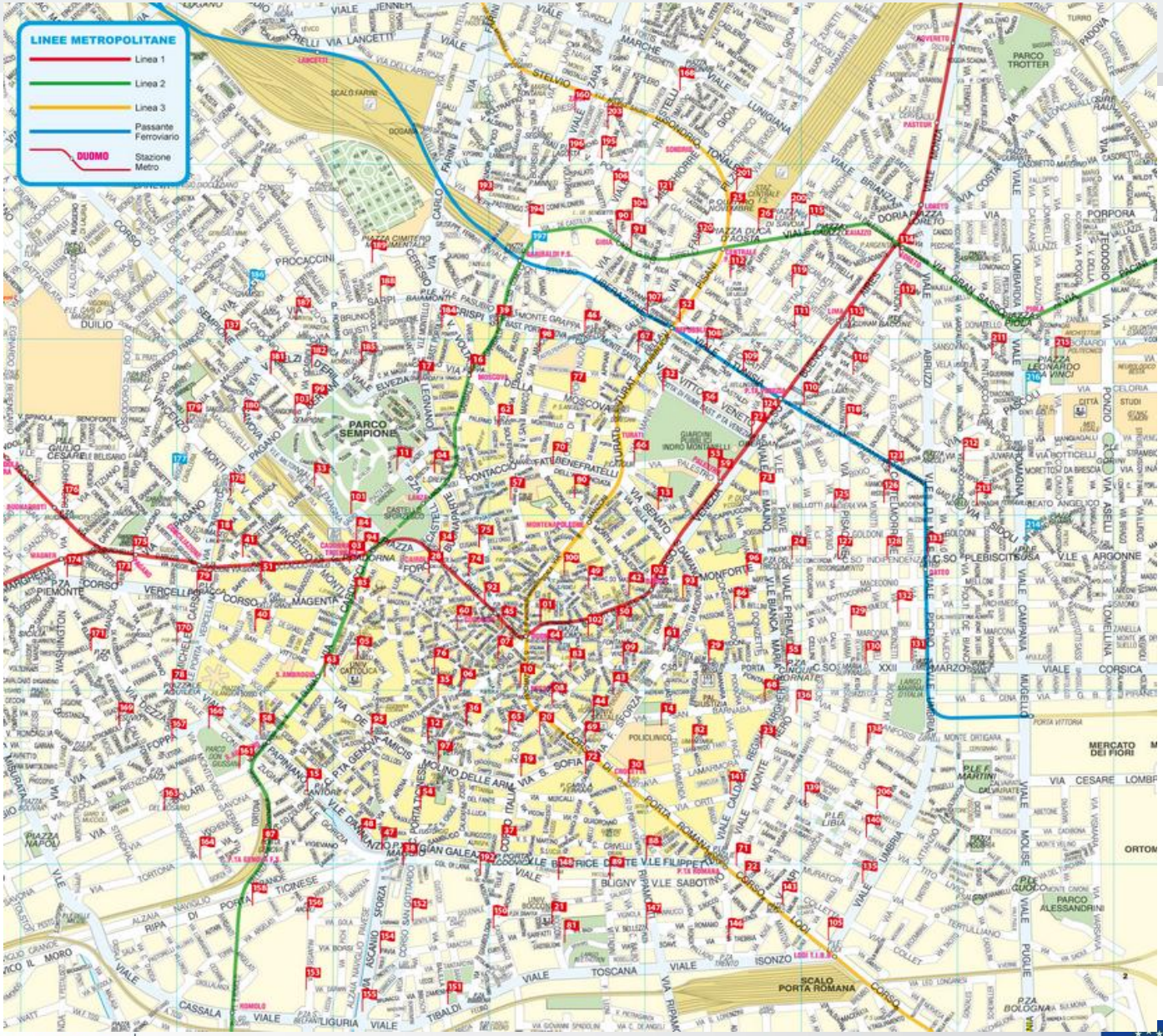


Number of BikeMI bicycles (2008-2013).
Source: IEFE-Bocconi University elaboration

Milan bike sharing system description

- BikeMi is a public system owned by the Municipality of Milan and managed by the public transport company ATM, which assigned operations through tender to the advertising agency Clear Channel;
- The investment to set up the system (including stations and bikes) was assured by a contribution by the Italian government. It amounted to 5 mil euros;
- The management of the system is financed by outdoor advertising spaces close to the stations managed by Clear Channel;
- The average yearly maintenance cost per bike is 1.000 euros.

BikeMi stations in Milan



Each station is less than 300 meters far from the next to assure a high **density**.

BikeMi stations in Milan.
Source: ATM, 2014

BikeMi. Tariffs

Different kinds of subscriptions are available:

- **Annual**: € 36.00
- **Weekly**: € 9.00
- **Daily**: € 4.50
- Number of annual subscribers: 10.000 in 2013, almost 40.000 in 2015

- Users are charged on credit card;
- Maximum consecutive use of the same bike is **2 hours**;
- Service is **suspended** if time limits are exceeded three times;
- Another bicycle cannot be picked up until the first is returned since 5 minutes.

- It is possible to subscribe through telephone, app, web, public transport customer desks,

TRADITIONAL BIKE'S TARIFFS		
TIME COST	Total	
FREE	€ 0,00	first half hour
€ 0,50	€ 0,50	second half hour
€ 0,50	€ 1,00	third half hour
€ 0,50	€ 1,50	fourth half hour
€ 2,00		every additional hour or fraction

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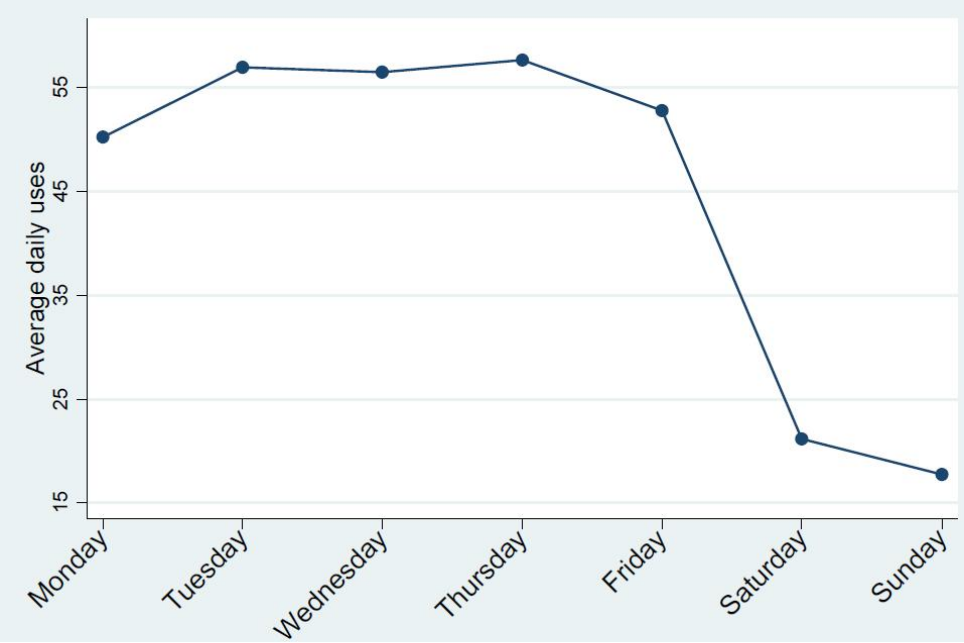
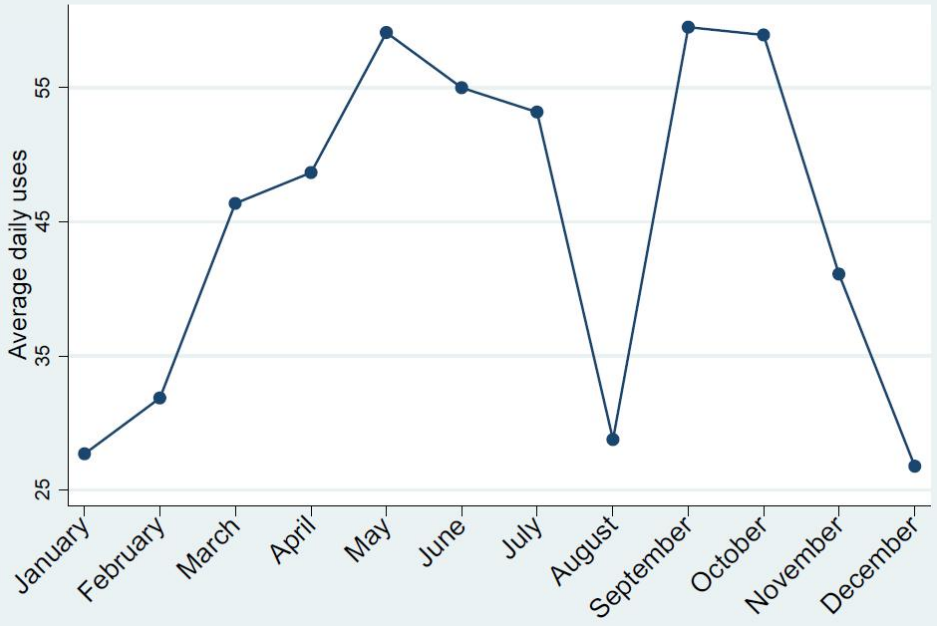
Average BikeMi station daily uses



Average BikeMi station daily uses per day of the week
Source: IEFE-Bocconi University elaboration



Average BikeMi station daily uses per month
Source: IEFE-Bocconi University elaboration

"BikeMi" city of Milan bike sharing case

Research objectives are:

- To assess which **attractors** influence the use of bike sharing;
- To examine how **proximity** and **visibility** factors affect bike sharing usage;
- To provide inputs to improve **planning and management** of service.

Research methodology and dataset

- The relevance of proximity to stations of a number of **attractors** with respect to the level of usage for each station is estimated;
- Dataset is composed by **161 stations** and up to 1490 observations for each station with a detailed description of every single BikeMI trip (itinerary, day of usage, etc.);
- The analysis is based on data from **December 2008** to **December 2012**;
- **Georeferenced data** on bike sharing stations and attractors are used;
- **Geographical attractors** (public transportation stops, universities and cultural sites.) within a distance of **100 meters** from BikeMi stations are considered;
- Safety factor is also considered (in terms of proximity to restricted traffic areas);
- Starting from Milan raster maps, **visibility dummies** are created for each attractor. These are equal to 1 if it is possible to see the bike sharing station from an attractor;
- **Weather data** are used as control variable in the regression (rainfall levels, temperature, etc.);

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Regression results

VARIABLES	(3)
Presence of attractors	
Bus and tram stop	-11.70***
	(0.376)
Metro stop	30.06***
	(0.839)
Train stop	58.56***
	(2.115)
Passante stop	42.41***
	(1.529)
University	4.769***
	(0.264)
Museum	10.36***
	(0.381)
Theatre	-3.559***
	(0.233)
Cinema	6.500***
	(0.281)
Safety	6.570***
	(0.203)
Visibility from attractors	
Bus and tram stop	15.52***
	(0.399)
Metro stop	5.663***
	(0.335)
Train stop	10.41***
	(0.746)
University	-7.353***
	(0.244)
Museum	-14.57***
	(0.454)
Theatre	10.62***
	(0.617)
Cinema	5.537***
	(0.286)
Control variables	
In Area C	31.47***
	(0.843)
Phase 1	-8.448***
	(0.630)
Temperature	✓
Rain	✓
Wind	✓
Day of week	✓
Month	✓
Year	✓
Constant	-59.23***
	(11.17)
Observations	166,256
R-squared	0.335
Number of id	161

Summary of results

Attractor type	Variable	Proximity	Visibility
Transportation	Tram bus	-11.70	+15.52
	Metro	+30.06	+5.66
	Train	+58.56	+10.41
	Passante	+42.41	
Leisure/People crowding	University	+4.77	-7.35
	Museum	+10.36	-14.57
	Theatre	-3.56	+10.62
	Cinema	+6.57	+5.54
Safety	Safety	+6.57	

Summary of research results: proximity to attractors

Main conclusions are:

- Presence of **metro** and **train stations**, **universities**, **museums**, **cinema** in correspondence of bike sharing stations significantly increase use;
- The proximity to places in which it is **safer to bike** (e.g. parks and pedestrian areas) also increases the use of bike sharing;
- The analysis highlights that bike sharing services are significantly and positively correlated with people reaching the city center with **medium/long trips** (metro and trains): **intermodality**

Summary of research results: visibility of stations from attractors

Main conclusions are:

- The more the station is visible the more effective is the location;
- Visibility from **tram**, **bus**, **metro** and **train stops** and from **theatre** and **cinema** attractors have positive influence;
- Analysis suggests to place bike sharing stations where their **visibility is maximized**.

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Thank you!

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