

A Cost Benefit Analysis of Ecopass Road Pricing in Milan

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Outline

- Introducing Ecopass main features
 - ▣ What is Ecopass ?
 - ▣ Small and smart ?
- Consequences of Ecopass implementation
- Cost Benefit Analysis
 - ▣ Current issues in toll pricing assessment
 - ▣ Outcome of Ecopass CBA

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Mailand Italien

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Milan Ecopass main characteristics



Ecopass Area (<http://www.comune.milano.it>)

Calcola il valore Ecopass del tuo veicolo

I veicoli trasporto persone e merci, Euro 4 con alimentazione Diesel e non provvisti di FAP, vengono assoggettati alla **Classe di Inquinamento 4**.

Anche per tali veicoli dovranno essere acquistati e/o Attivati i necessari PIN Classe 4

Richiedi Ecopass

Tipi Ecopass	Descrizione	Info Foras	Quantità
a) Ecopass 2 Euro	Singolo ingresso GIORNALIERO per veicoli con Classe Inquinamento 3	Verifica	<input type="text"/>
b) Ecopass 5 Euro	Singolo ingresso GIORNALIERO per veicoli con Classe Inquinamento 4	Verifica	<input type="text"/>
c) Ecopass 10 Euro	Singolo ingresso GIORNALIERO per veicoli con Classe Inquinamento 5	Verifica	<input type="text"/>
d) Ecopass 20 Euro	Ingresso MULTIPLO per veicoli con qualsiasi Classe Inquinamento	Verifica	<input type="text"/>
e) Ecopass 50 Euro	Ingresso MULTIPLO per veicoli con qualsiasi Classe Inquinamento	Verifica	<input type="text"/>
f) Ecopass 100 Euro	Ingresso MULTIPLO per veicoli con qualsiasi classe di inquinamento	Verifica	<input type="text"/>
g) Ecopass 50 Euro	Ingresso MULTIPLO AGEVOLATO 1°-50° ingresso veicoli Classe Inquinamento 3	Verifica	<input type="text"/>
h) Ecopass 125 Euro	Ingresso MULTIPLO AGEVOLATO 1°-50° ingresso veicoli Classe Inquinamento 4	Verifica	<input type="text"/>
i) Ecopass 250 Euro	Ingresso MULTIPLO AGEVOLATO 1°-50° ingresso veicoli Classe Inquinamento 5	Verifica	<input type="text"/>
l) Ecopass 60 Euro	Ingresso MULTIPLO AGEVOLATO 51°-100° ingresso veicoli Classe Inquinamento 3	Verifica	<input type="text"/>
m) Ecopass 150 Euro	Ingresso MULTIPLO AGEVOLATO 51°-100° ingresso veicoli Classe Inquinamento 4	Verifica	<input type="text"/>
n) Ecopass 300 Euro	Ingresso MULTIPLO AGEVOLATO 51°-100° ingresso veicoli Classe Inquinamento 5	Verifica	<input type="text"/>

Carrello Acquisti

Tipi Ecopass	Descrizione	Quantità	Prezzo Unitario	Totale
a) Ecopass 2 Euro	Singolo ingresso GIORNALIERO per veicoli con Classe Inquinamento 3	1	2,00	2,00



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Small and smart ?

- Limited geographical scope and toll magnitudes

	Milan	London (Stockholm)
Surface	8 km ² (Milan 181 km ²)	40 km ² (Stockholm 47 km ²)
Daily access	79 000 veh.	316 000 veh. (Stockholm 100 000)
Maximum toll	10 €	8 £
Average toll/veh.	4,55€ (excl. LTZ residents)	
	1,31€ (incl. LTZ residents)	
	1 € (incl. all exempted)	2,6€ (incl. all exempted)
Toll revenues	12.4 Mil €/yr (without fines)	310 Mil €/yr (Stockholm 69 mio€,

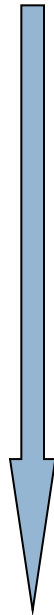
Smart ?

- Very low implementation costs
 - ▣ Consolidate on existing infrastructure and on existing organisations
 - ▣ Technologically functional
- Differentiation is fairly developed

Low diff.

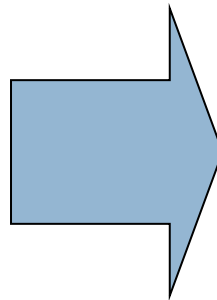
Moderate diff.

High diff.



- N. of entrances
 - km driven
- Time differentiation
 - 7:30 - 19:30,
 - working days/non working days,
 - August
- Emissions
- Pers. vs. freight

- Emission class (Euro 1,...,5)
- Diesel vs. gasoline
- Anti Particulate Filter
- Veh. type (freight vs. passenger)



Toll class

- I
- II
- III
- IV
- V



Higher
pollution
Higher
toll

Milan Ecopass main characteristics

Vehicle types toll class and tariffs

Vehicle type	Toll Class	Daily Entrance	Multiple discounted entrance (100/yr)	Annual rate for residents
Lpg-methane-electric-hybrid	Class I	Free	Free	Free
Auto and freight gasoline Euro 3, 4 or more recent Auto and freight diesel Euro 4 without FAP (until 30/06/08) Auto and freight diesel Euro 4 or more recent with FAP	Class II	Free	Free	Free
Auto and freight gasoline Euro 1 and 2	Class III	€ 2	€ 50	€ 60
Auto and freight gasoline pre-Euro (Euro 0) Auto diesel Euro 1, 2 and 3 Freight diesel Euro 3 Bus diesel Euro 4 and 5	Class IV	€ 5	€ 125	€ 150
Auto diesel pre-Euro (Euro 0) Freight diesel pre-Euro (Euro 0), Euro 1 and 2 Bus diesel pre-Euro (Euro 0), Euro 1, 2 and 3	Class V	€ 10	€ 250	€ 300

Penalty associated with diesel vs. gasoline

Penalty associated with freight vs. passenger

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Consequences of Ecopass implementation

Milan and London compared

- Traffic reduction

Milan	London
-19.5% (March 2008)	(2003-2005) veh.km - 20,0% (mainly auto)

- PT

	Milan	London
Speed	+9% average travel speed (surface transport)	
Patronage	+9% boardings in metro stations within LTZ	+37% bus travels (first year of charging)

Consequences of Ecopass implementation

Milan and London compared

- Emissions decrease

	Milan	London
Pm10	<u>March 2008</u> 32 μm^3 <u>2007</u> Pm10 51 μm^3 <u>2006</u> Pm10 56 μm^3 Avg. -40%	Pm10 - 7%
NO ₂	<u>Milan Avg.</u> 98 μm^3 <u>within LTZ</u> 80 μm^3 (-18%)	Nox -8%
CO ₂	1,4 μm^3 1,6 μm^3 (-12%)	CO ₂ -16%

Consequences of Ecopass implementation

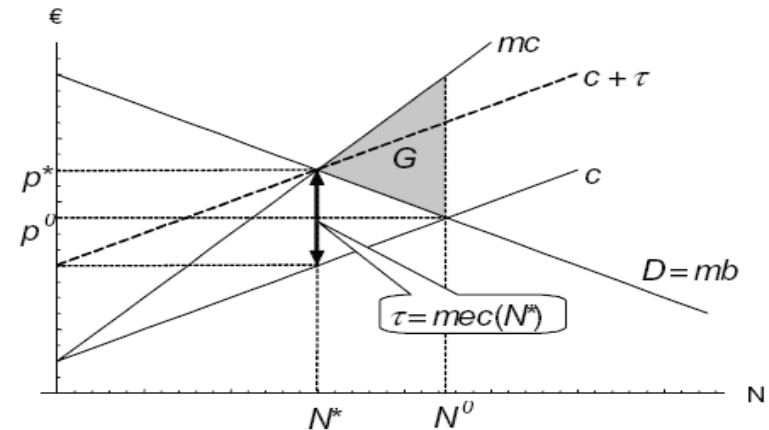
- Strong concentration of payments on a limited number of users
 - ▣ 13% of vehicles (freight veh.) pay 42% of the toll

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Cost Benefit Analysis - literature findings (London)

- CBA for London:
 - Shaffer & Santos (2004) (only demand elasticity)
 - Prud'homme & Bocarejo (2005)
 - Mackie (2005)
 - TfL (2003, 2007)
- Main results
 - Strong sensitivity of results to VTTS
 - Implementation costs are so as to change the whole picture
 - traffic outside of the cordon is a key element (complementarity vs. substitutability)



Cost Benefit Analysis - literature findings (London)

- CCCL main effects:
 - ▣ Business travellers - net gainers overall
 - ▣ Private car users - net losers overall
 - ▣ Bus travellers: net gainers (↓congestion; ↑supply)
 - ▣ Public administrations: gainers (charges)
 - ▣ Decreased social costs: mainly ↓accidents
- Mackie (2005) win-win scenario!

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Cost Benefit Analysis - Milan

- Caveats
 - ▣ Scheme began operating 2nd Jan 2008
 - ▣ Most data 2008
 - Data are still not published/not existing
 - Penalty payment may change the picture
 - ▣ Medium to long term effects are incipient
- but still useful, we hope

Category	Sub-category	Travel time and reliability	Operating costs	Other costs and services	Financial impacts (excluding penalties)	Total
Car, freight vehicles, taxi	Passenger vehicles	11.4	0.5	-5.9		
	Freight vehicles	1.2	0.1	-1.0		
Bus and tram	Passenger transportation	5.6				
Deterred trips	Passenger vehicles			-2.7		
	Freight vehicles			-0.4		-0.4
Social costs	Accidents			8.4		8.4
	CO ₂			0.7		0.7
	NO _x and PM ₁₀			1.3		1.3
Administrations (City adminstr., Region, State)	Fuel duty				-2.2	-2.2
	VAT				-0.8	-0.8
	Tolls		-7		12.4	5.4
	Infrastructure			-0.6		-0.6
	Parking revenues				-1.5	-1.5
Private parking	Net revenues				-1.0	-1.0
Total		18.2	-6.5	-0.2	-5.6	6.0

4. Main social benefits:

- Time savings
- Accidents
- Emission abatement is a minor benefit

3. Transports users are :

- net losers (without counting for externalities)

- net winners (counting for part of externalities)

But

• PT users are winners

2. Administration are slightly beneficial

But

- Partial equilibrium

- Penalty (up to 15 mio/yr)

1. Overall balance is positive

Summary and Conclusion

- Welfare improving policy
 - ▣ Transport users are better off (incl. accidents) on the whole
 - Freight transport are losers
 - PT users are winners
 - ▣ Environmental objectives achieved but overpassed by other benefits (time and accidents).
 - ▣ Public sector has a benefit
 - ▣ Strong effect of penalty on the general picture
- Long term
 - ▣ financial sustainability relies on revision of the tolling

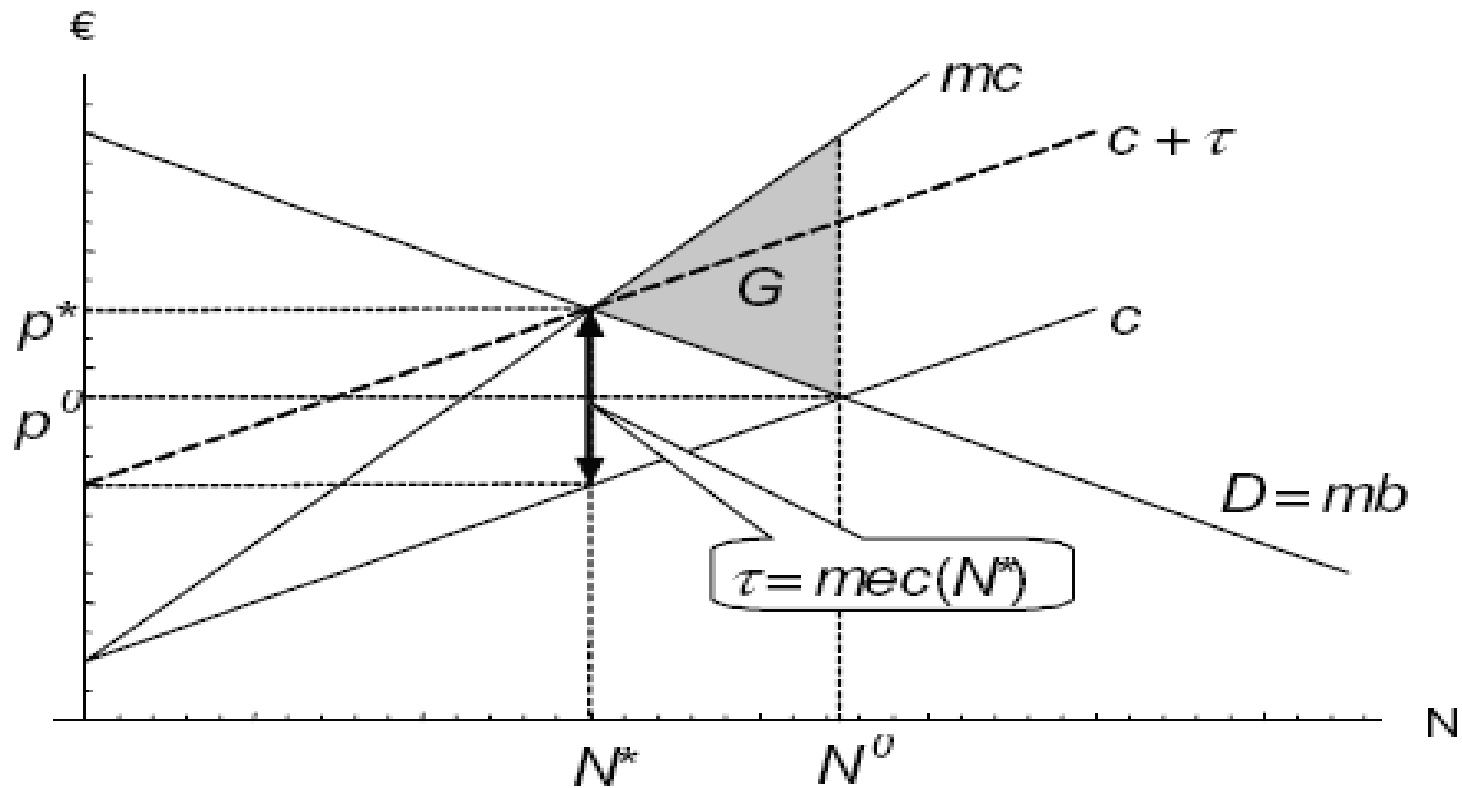


Thank you for your attention

Next steps

- Further data acquisition and analysis
- Redistributive effects analysis
- Effects on public transport analysis
- VTTS study for Milan
- SP experiment to study the most acceptable solution to guarantee financial sustainability

Rod Pricing: theoretical framework



(Verhoef 2007, p.69)

Road Pricing: theoretical framework

- In general we assume:
 - ▣ Infrastructure usage cost increase
 - ▣ Reduced number of users
 - ▣ Wealth transfer from Users to State
- Potential drawbacks:
 - ▣ Regressive
 - ▣ SR: Congestion “migration”
 - ▣ LR: residential and commercial “migration”

Milan and London compared

□ Milan and London main facts

Ecopass	CCCL
Starts January 2008	Starts 2003
Objective: reducing pollution (Pm10 in 2008 > 50 μ gm ³ limit in 46 dys so far)	Objective: reducing traffic congestion (Pm10 34 μ gm ³ in 2007 never above 40 μ gm ³ limit). After 2008 LEZ atmospheric pollution reduction
Charging differentiation: See previous slide!	Charging differentiation: NO differentiation by type of vehicle or dirver (5 £) after july 2005 (8 £). LEZ 200 £ (busses/lorries) 100 £ (mini vans)

Ecopass CBA (preliminary)

□ Prud'homme & Bocarejo (2005)

Table 2

Benefits and costs of the london congestion charge

	Per day (1,000 e)	Per year (million e)
Benefits		
Reduction in congestion costs	272	68
Increased speed for bus users	124	31
Environmental benefits	20	5
Total, recorded benefits	414	104
Costs		
Implementation costs		172
Subsidy to buses	18	5
Total, recorded costs	707	177

Ecopass CBA (preliminary)

- Mackie (2005)
 - ▣ P&B 2005 - underline public investment
 - ▣ CCCL is not a financial disaster - different VTTS (15,6€/h P&B - TfL (2003) 36,1 €/h)
- Hensher & Goodwin (2004) Great heterogeneity in VTTS need for segmentation
- Other issues: complementarity/ substitution between inner&outer traffic/ safety effects/ punctuality

Ecopass CBA (preliminary)

QuickTime™ e un
decompressore
sono necessari per visualizzare quest'immagine.



Milan and London compared

□ Charge payments by users type

Milan	London
No specific charging for private vehicle use	62% of total charges paid by business users (around 40% of total) and freight
5€ and 2€ paid by 11% and 9% of private personal transport	<i>38% paid by private personal transport (commuters included)</i>
5€ and 2€ paid by 37% and 5% of freight and collective public transport	
<i>Less than 20% of private personal transport paid the access permit to the LTZ; 58% of freight and collective public transport</i>	