

Economical Aspects

Pay per Risk – Pay per Use

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Content

■ “Pay per Risk” - Insurance

- car insurance today
- distance-based insurance
- different pricing options
- effects

■ “Pay per Use” - Road Pricing

- what is road pricing?
- technical side
- examples: Singapore, Oslo
- PRoGRESS
- effects

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Motivation I

- Today, a lot of products have the same price, no matter **how often** you use it
 - newspaper, television
 - roads, parks
 - car insurance

- With more and more technology involved, you have the **possibility to measure** the amount of use and charge it
 - Digital Rights Management (DRM)
 - pay per view, pay-tv
 - use of a chair

And with Ubiquitous Computing: “Sky is the limit!”

Motivation II

■ But,

- how can the economy take advantage of the fact that everything is measurable?
- how do people change their decisions if they have to pay “for a sit in the chair”? Are they going to change it?
- Pay for using something: good or bad?

PAY PER RISK
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INSURANCE

Insurances Today

- There are about 20 – 30 risk groups insurances put you into, classified after **age, car type, number of accidents, nationality**
- Price **does not reflect** marginal costs
- Once a Policy is purchased, **no savings** from risk reductions.
- What if we can measure this risk?

Distance-Based Insurance

- It is a fact that the **more you drive the bigger is your risk** for an accident
- What if the risk factor is calculated **depending on the distance** you drive in one year?
 - Converts insurance into a **variable cost**
 - Prices should reflect costs, and who reduces the costs should receive proportionate savings
 - With distance-based pricing, these savings are returned to the **individual driver** that reduces mileage
- What kind of **pricing options** are realistic?

Different Pricing Options I

- **Mileage Rate Factor** (Hundstad, Bernstein and Turem, 1994)
 - considers annual mileage rate factor into existing rate system
 - **drivers can't predict** how much they drive in the future
 - travel impacts & benefits are small
- **Pay-at-the-Pump** (Sugarman, 1993; Wenzel, 1994)
 - 25-50 cents per gallon surcharge on gasoline
 - payments based on vehicle fuel consumption **not risk factors**
 - covers only a third of total insurance premiums
 - relatively large reduction in fuel consumption, providing modest overall benefits

Different Pricing Options II

■ Per-Kilometer/Minutes Premiums (Butler, 1993; Baker and Barrett, 1998)

- prepay for kilometers/minutes one expect to drive
- 3 approaches to coverage:
 - A: on prepaid miles/minutes
 - B: regardless of prepayment
 - C: regardless of prepayment, with late payment penalties

■ GPS-Based Pricing

- Prices insurance based on driving occurs using a GPS transponder.
- virtually incorporate any rating factor related to driver, vehicle, time and location
- Annual costs for equipment, billing and royalties (ca. \$150/year)
- attracts drivers who drive **low-mileage** vehicles

Effects I

■ Benefits

- Reflects insurance costs of **individual** vehicle
 - economical efficiency
- **Reduces** average annual **mileage**
 - reduces traffic accidents, congestion & roadway costs
- **Increases** road safety
- Increases **consumer choices** & **offers new opportunities**
 - save money

Effects II

■ Risks

- Insurances have to **change premiums calculation**
 - new procedures & computer programs
- increasing **transaction costs**
- premiums & insurance revenues become **less predictable** for driver & insurance company
- increasing premiums for some type of drivers
- **Scepticism** of predicted benefits

PAY PER USE
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ROAD PRICING

Road Pricing

- “A generic term for the **use of roads**, using direct methods **charging the users** of a specific section of the road network for its use” [www.wikipedia.org]
- UbiComp: possibility to make a **price discrimination** → Vignette per “Use”

■ Purposes

- **Financing Function** – returns revenue
- **Controlling Function** – revenue will affect traffic
- **Improve Environment** – reduce emissions & noise
- **Improve Accessibility** – reduces congestions on certain hours
- **Improve Quality of Life** for city residents & visitors

Technology

■ On Board:

- GPS (Global Positioning Systems)
- AVI (Automated Vehicle Identification)

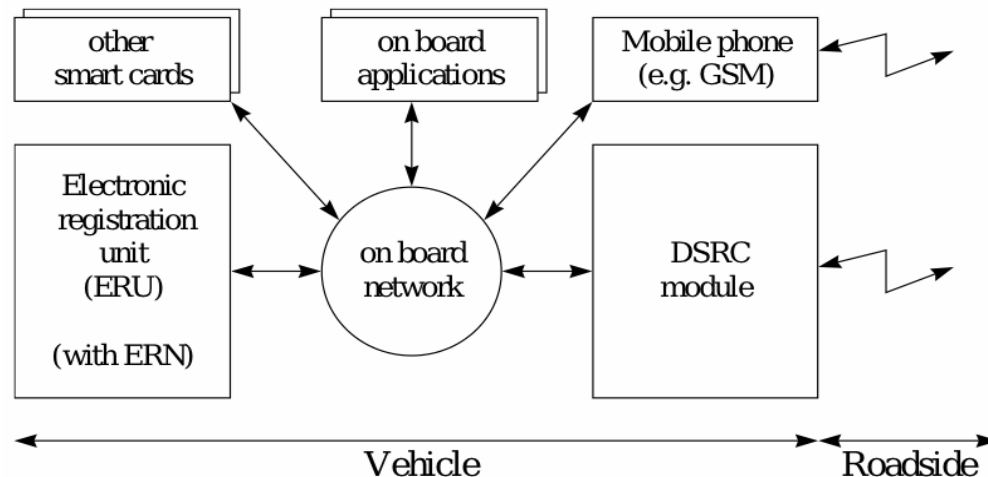
■ From Outside:

- ANPR (Automatic Number Plate Recognition)
- Coin Drop



On Board - AVI

- AVI = process of identifying vehicles using on board equipment (OBE) combined with the unambiguous data structure [ISO 14814, 1995]
- **Architecture**
 - **ERU** (smart card or equivalent device)
 - On board communication network
 - **DRSC** (Dedicated Short-Range Communication) module for the communication with external readers
 - **GSM** or **UMTS phone** for wide area connections which may require the exchange of the AVI data

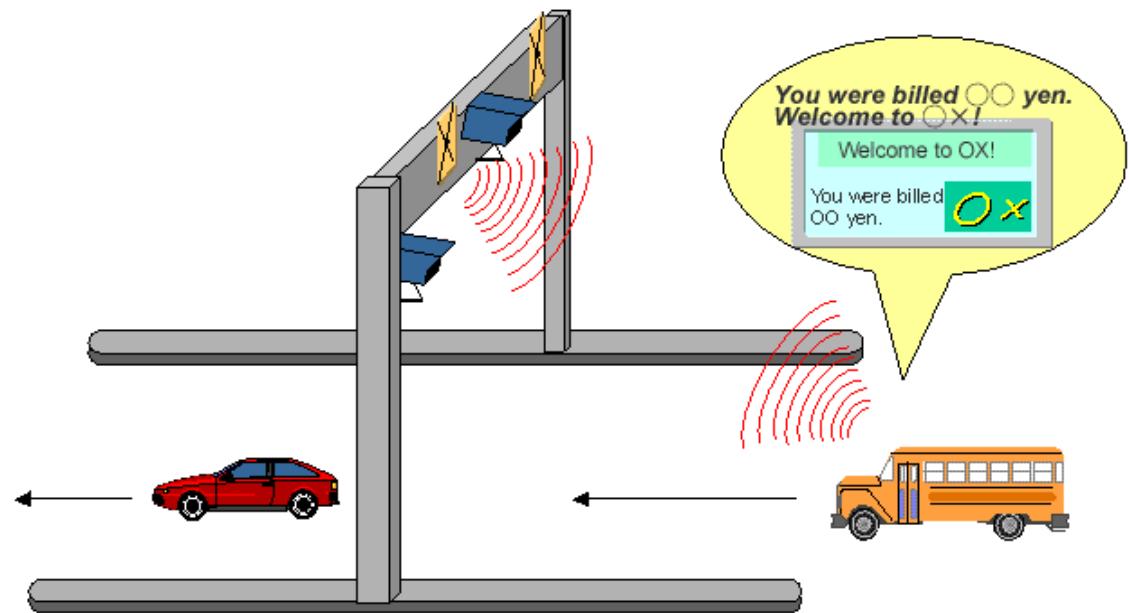


Road Pricing already in Use

- MAUT in Germany, LSVA in Switzerland
- Private Highways in Italy
- Electronic Toll Collections: London, Oslo, Trondheim, Bergen
- Electronic Road Pricing: Singapore
- High-occupancy toll lanes (HOT-Lanes):
 - Toronto (Highway 407),
 - Orange County, California (SR-91),
 - San Diego, California (Interstate 15)

Singapore I

- First modern road pricing system in the world (since 1975)
- Since 1998 **totally automatic** system
- High exploitation of land and rather high standard of living
- Only system with the **purpose to regulate traffic**, in order to increase accessibility
- Nearly **everything** is covered



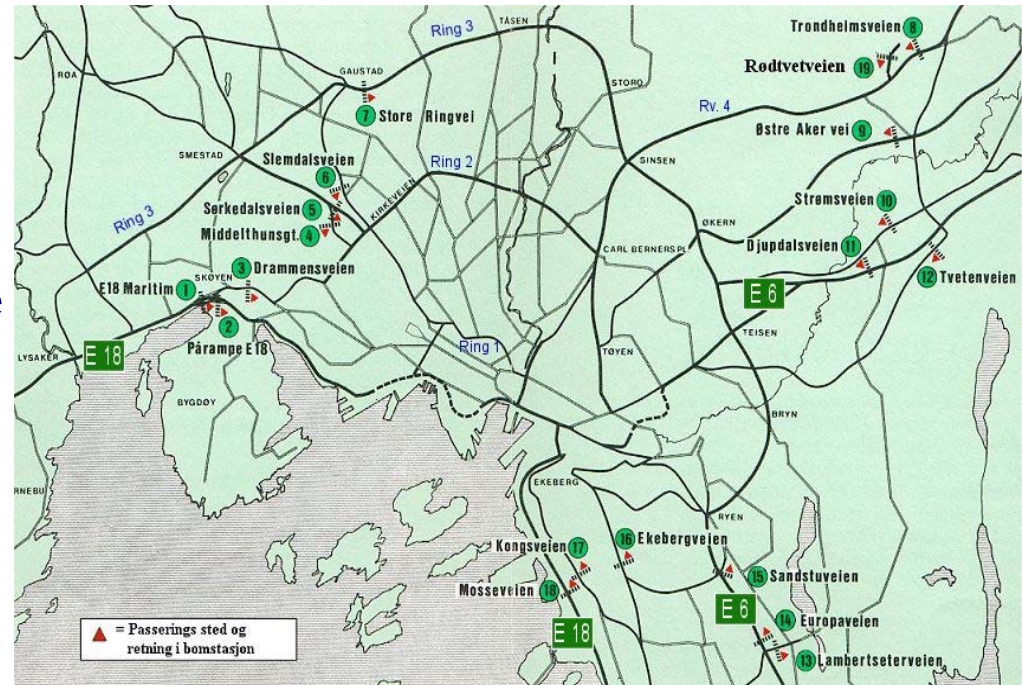
Singapore II

- The basis for the charge is to achieve a **target-speed**.
- If the **speed drops** the **charges increase** and vice versa.
- Fees are revised every three months.
- Electric – and hybrid vehicles **pay less**.
- The revenue goes into the national account.



Oslo

- Apart from Singapore, only large city with **proportionally full coverage**
- Ring of 19 toll stations on all roads leading into central Oslo
- Purpose to **finance new investments**, that otherwise take too long to realize
- The emphasis was on **new road constructions**.
- Payment is either electronic, manual or through coin-drops



Effects I

■ Singapore

- **daily traffic** in this area dropped by 44%, and by 75% during peak hours
- **daily number of trips** drop of 40%

■ Oslo

- systems are expressively designed **not to affect** the traffic.
- reduction of traffic during morning peak = 10%
- while traffic within the toll ring was reduced by 20%

Effects II : Traffic

- It does not take very dramatic reductions of total traffic volume to **eliminate queues**
- most road pricing systems have relatively **small effects** on total **number of car trips**
 - lack of alternatives
 - only charge by congestions or during peak hours
- **greatest effect:** change of time for travelling
- charges that reduce congestion also increase the accessibility for bus traffic

Effects III : Environment

- depend on how the charges are constructed
- emissions such as volatile organic compounds & carbon monoxide are 250% higher at congestion than when traffic flows
- new roads can be avoided, which otherwise increase number of car trips
- rather small effects on traffic safety

PRoGRESS Project

- Demonstration project researching urban road pricing in eight European cities



- “to demonstrate and evaluate the effectiveness and acceptance of integrated urban transport pricing schemes to achieve transport goals and raise revenue”

PRoGRESS - Acceptance

- **Consultation** – developing a **long-term strategy** for communication is vital, with concerns such as exemptions and privacy considered in scheme design.
- **Transport strategy** – to achieve higher level of acceptance, road pricing should be considered as **part of a large strategy** that includes other transport improvements.
- **Revenues** – the **re-investment of revenues** in the transport system is vital for gaining user acceptance.
- **Emphasis on information** – the **public** will need to be **kept informed** about a pro-active campaign.
- **Political champion** – this can greatly help the acceptance of a road pricing scheme, although the timing of decisions can be limited by elections.

Conclusion

- individually costs are fairer
- risk that only rich people can afford it
- UbiComp is just a tool to affect the economy
- depends on how, where and who is using this tool
- acceptance of UbiComp is very important
- protection of data privacy

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Questions

