

The electronic road pricing in singapore economics essay



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Road pricing is a transport policy where motorists are charged for using the roads. The main principle is that the price paid for the use of a road should reflect the costs of its use. (Transport policy 2005, p373). The importance of road pricing has increased in the last few decades. 'Given the growth in road traffic and its adverse side-effects road pricing has become an important contemporary policy issue. - (Kenneth & Verhoef, 1998, p4)

The congestion pressures faced by regions will intensify going forward. Given that environmental and social sustainability also deteriorates if no action is taken to control growing traffic regions like Northern Ireland must address these challenges and pressures in their transport system. A recent survey found that Belfast was the 7th most congested city in Europe (NI budget, p10)

There are various terms used for road pricing such as, road user charging, road tolling, congested charging, congested pricing etc, all of which generally reflect the same principle which are specific charges levied for the use of roads. There are different forms of charges which include road tolls, congestion charges and distance or time based fees. There are more specific charges that focus on certain classes of vehicles, and environmental issues.

There are many different reasons why road pricing is brought in, but the main reason why these charges may be used is because they generate revenue which is usually for road infrastructure financing. The revenue generated can also be used as a transportation demand management tool which is used to reduce peak hour travel and the associated traffic congestion. Limiting traffic congestion can have positive benefits on road

travel such as air pollution, greenhouse gas emission, noise, and visual intrusion and road accidents.

The most common method of revenue regeneration is through tolls, most countries have tolls on main roads, bridges and tunnels. The revenue generated is normally put back into the operation and maintenance of these tolls but they can also be used as general tax funds.

Another method of charging is 'Road Congestion Pricing' this method involves charging road users for entering urban areas. Other methods may include pollution charges; this may involve charging vehicles with higher tailpipe emissions. It should be noted that there aren't many road congestion charges as they are limited to a small number of cities and urban roads. But there are a number of road pricing schemes implemented in the world and there is a growing number of cities are interested and willingness to adopt road pricing schemes to resolve their transport problems, certain schemes include:

The electronic Road pricing in Singapore

The London congestion charge

The Stockholm congestion tax

The Milan Area C

And high-occupancy lanes in the United States

Other examples of pollution pricing schemes include the London low emission zone.

This report will look at current road pricing schemes by understanding how they are being received by the public, do they contribute to the economy and do they benefit the environment. This report will look to ask 4 main questions:-

The theory of road pricing?

What are the benefits and disadvantages of road pricing?

Road pricing case study

What is the government's role on road pricing?

The Theory of road pricing

Road pricing is not a new concept, throughout history road users have been charged for using the road. The two main purposes for charging are to control demand, which can help improve congestion and improve environmental problems, and to raise revenue, to finance projects that benefit drivers and those affected by traffic- (Whittles- 2003, p1)

Economically, road user charging is to cover construction operation, maintenance costs of new roads or main roads. The theory and goals of road pricing imply that the extent of charges imposed on an individual should reflect the costs they impose on others and on the environment, thus helping to reduce negative externalities of traffic. (Saleh & Sammer, 2006 p2)

There are essentially two reasons why road operators and city authorities would consider introducing a charge for the use of roads: to manage congestion or to finance the infrastructure. (Pickford & Plythe 2006 p. 1)

The execution of road pricing theory into practice is complex and extremely difficult, this is because the 'pricing structure has to reflect the actual costs the motorists impose on the system according to time, distance and place and/ or other applicable variables'-. (Saleh & Sammer, 2006 p2), although most road pricing schemes are theoretically possible to determine, there may be problems with political and or public acceptance.

One major concern is that these road pricing can turn into another imposed toll or fixed charge for travellers and a means for local authority to generate revenue. It is therefore important that these road pricing schemes are, developed, implemented and monitored, this can be achieved through Travel Demand Management (TDM) pricing. An integrated programme of TDM pricing and non pricings measure should therefore be devised in order to assist local authorities and cities in developing appropriate schemes that meet their local objectives.

There are a range of terms used to describe road pricing, many of them intertwine and overlap with each other which include:

Road Tolls - Tolls are the most common and oldest form of road pricing. They are mainly situated on Arterial routes such as highways, bridges and tunnels. Tolls are seen as a way to fund and recover capital costs of the particular road, they are considered as the most equitable and economically efficient method of funding.

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In some cases toll lanes may be extra lanes added to the highway, and some tolls are varied between peak and off peak times, to manage demand and reduce congestion. Problems occur when users choose alternative routes; this can lead to other routes becoming congested.

Congestion pricing/ charges- Is a system to charge users mainly in urban areas where it is congested, in an effort to reduce peak-period traffic volumes to optimal levels. The objective of this system is to make users more aware of the costs that they cause during peak demand and that they should pay for the additional congestion created therefore encouraging the redistribution of the demand in space or time. Tolls are set in these areas and can be fixed or vary in costs, depending on the level of congestion that exists at a particular time. Costs vary with high prices in congested areas and lower prices at less congested times and location. Such goals are to shift from private to public transport and to minimise co2 emissions. London, Singapore, Milan and Stockholm are just a few examples of cities that have adopted congested pricing.

Cordon Tolls- Cordon tolls are setup where vehicles are charged based on the distance they travel in the charging zone. They are normally located in the city centre, these cordons can be adjusted are easily expanded. Rates could vary by time of day and vehicle type. In some cases they only apply during peak time periods. This system is setup to solve the traffic problems in the city centre in order to reduce congestion and lower co2 emissions

High Occupancy Toll (HOT Lanes)- is a road pricing scheme that gives motorists access to High- Occupancy vehicle (HOV) lanes. These lanes

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enable more motorists to use HOV lanes, which minimize traffic congestion and limit CO₂ emissions. They are also an efficient method of raising revenue through tolls, the tolls change throughout the day according to real-time traffic conditions. HOT lanes are very beneficial even those who choose not to use them, due to the congestion minimised.

Vehicle use Fees- This form of road user charging is a distance-based charge, where mileage fees can be used to fund motorways and reduce congestion, pollution and accident risk. It is a system that proposes that vehicle registration fees and fuel taxes be replaced by a variable road user charge using GPS-based pricing methods.

There are a number of questions each government/ local authority will have to ask itself once they decide to implement a road pricing scheme.

Which system to use?- In order to decide a particular scheme, the government, city, local authorities etc will have to decide which of the above schemes to use or create an entirely new one. They will have to be designed to meet its technical objectives, the objectives of the local area and to optimise the public and political acceptability. Different methods will need to be investigated to assist the local authorities and cities in development of appropriate road pricing schemes that meet their local objectives and solve the local transport problems and which would be publicly feasible, whether it is funding for the local transportation, high congestion or those who suffer from social exclusion or limited accessibility.

How to set the pricing structure?- This is essential, creating a road pricing scheme that has high charging will create social exclusion and will effect <https://assignbuster.com/the-electronic-road-pricing-in-singapore-economics-essay/>

public opinion for that scheme. While setting a low charge may result in low revenue generated which may not cover operating costs of the scheme and therefore no money is generated for the local transport.

Economically the pricing structure should reflect the actual costs the motorists imposed on the system accordance to time, distance and place and/ or any other appropriate variables. It is important that the pricing structure are flexible this will make it easier to alter in the future giving room for inflation and other variable costs that cannot be seen. It is important that prices set are fair and reflect the actual costs of using the roads.

Where to spend the revenue? - Revenue generated by the road pricing scheme, by law has to be invested back into the local transportation system. The allocation of revenues generated should be carefully investigated in order to optimise the schemes technical objectives as well as their public acceptability. In other words the revenue should be spent on measures to solve the local transport problems. Revenue generated from road pricing schemes should 'to be universally acceptable to the respondents, road pricing revenue must be spent on measures that solve the transport problems or alleviate the environmental impacts caused by road users who pay the charge.'(Whittles, 2003 p215)

What are the impacts of pricing schemes?- All road pricing schemes have a multidimensional dilemma that should take into account the short and long term impacts on traffic, environment, economic activities, social exclusion, travel behaviour and attitudes as well as public acceptability.

The data collected should give an understanding if their targets are being met and whether the scheme overall is successful. Generally most road pricing schemes have been successful in limiting congestion and generating revenue. It is important that road pricing schemes renew their schemes through the introduction of new/updated technology, only then can they achieve their objectives.

Public View on Road Pricing-Despite the strong support for road pricing from the professional transport planning community, members of the public and politicians remain unconvinced of its potential benefits and wary of the significant changes that road pricing could pre-empt. The idea of urban road pricing and acceptability are features of our society, and different systems of road pricing will stimulate different options about acceptability

Public acceptance is critical to the feasibility of road pricing current perceptions are based on respondents engaging with pricing largely as an abstract concept. Attitudes change when a fully developed proposition is laid out. If the benefits are good and the technology can deliver then more people would be acceptable to it.

What are the advantages and disadvantages of road pricing?

It is important to assess the advantages and disadvantages of road pricing, this will enable governments/ local authorities to make the decision whether to implement road pricing schemes. The need for road pricing schemes is essential 'with the growing level of traffic congestion combined with delays to public transport, and the failings of non-pricing measures and policies in achieving effective impacts on traffic congestion and other related urban

problems. (Saleh & Sammer, 2006 p2) these problems will escalate without road pricing schemes.

Figure 1 is taken from the Eddington report showing the congestion on the road network in Great Britain in 2003.

(Eddington Report, 2006 p 28)

When looking at road pricing at a national scale there are potential benefits and advantages. Introduction Road pricing at a wider scale is essential, as there are potential benefits of a well- designed, large scale road pricing schemes. According to the Eddington Report a national road pricing scheme could 'reduce congestion by some 50% of what it would be in 2025. It continues to state that it could reduce the economic case for additional strategic road infrastructure by 80%, and benefits could total £28 Billion a year in 2025.(2006, p 40) Although cost of such a scheme has not been developed they would have to be extremely high to outweigh the benefits of this scale.

Introducing it at a large scale would also offer significant environmental benefits by reducing and reshaping infrastructure needs, as well as offering opportunities to price more appropriately for environmental costs and reduce emissions.

According to the Eddington Report a national road pricing would provide 'some £500m of environmental benefits a year in terms of reduced emissions' (2006, P40). Without road pricing, beyond 2015 there would be a case for significantly increasing the current rate of enhancement of the

strategic road network. Other benefits of having National and urban schemes would also increase demand for, and the cost effectiveness of, public transport in some of the most congested areas and routes, especially at peak times.

However there are also disadvantages with a road pricing scheme at a national level. The cost of such a scheme would be extremely high and the revenue generated must outweigh the cost. Also some motorists may be worse-off unless they can be flexible with travel times or good alternative travel options are available.

Alternative methods must be looked at apart from road pricing, this will involve greatly increasing the road build which would significantly increase the existing rate of expansion in the inter-urban road network, or have very high levels of road congestion, both of which involve having more motorists and therefore would tremendously increase CO₂ emissions.

It is important to assess each particular road pricing scheme in terms of advantages and disadvantages.

In regards to congestion pricing, it is very effective at reducing congestions particularly in urban areas, many believe without congestion pricing urban traffic congestion is virtually unsolvable. Reducing congestion will have economic benefits and environmental benefits such as lower CO₂ emissions.

Implementation of congestion pricing has reduced congestion in urban areas, but has also sparked criticism and public discontent. Critics maintain that congestion pricing is not equitable, places an economic burden on

neighbouring communities, has a negative effect on retail businesses and on economic activity in general, and is another tax. Although some believe that congestion pricing merely shifts vehicle traffic to other routes and therefore increases congestion on that route and in the long term few benefits can be seen

Some road pricing schemes reduce total vehicle travel and can also reduce road parking facility costs, increase road safety, encourage more efficient land-use and improve community liveability

In relation to Value Pricing and HOT lanes they increase transportation options. On un-priced roads motorists have no alternative to being delayed by congestion. Value Pricing and HOT lanes allow motorists to choose between driving in congestion or paying a toll and using the HOT lanes. This gives the individual motorists the choice that meets their needs for a particular trip.

The method in which payment is made can have a major effect on the environment. In relation to tolls, although they are a method of generating revenue on motorway and Arterial roads, tolls collection requires motorists to stop at booths this causes delays and congestion. This therefore leads to increased co2 emissions and energy consumption. Although new electronic tolling can reduce the transaction costs.

It is a fact that road pricing increases costs to motorists, but the money generated from the road pricing can benefit the road users as the money can be returned as rebates or reductions in other taxes, or used in other ways to

benefit motorist. This depends on the road pricing scheme and whether it generates enough money.

Certain road pricing schemes which invest in additional highway capacity can increase total automobile travel. This can lead to many different disadvantages such as higher congestion levels, higher parking costs, crashes, pollution and sprawls. Expanding the size of a highway can also have a major negative effect on the community, as the expansion can cut through communities and reduce their liveability. Other problems can arise through highway privatization which can result in higher pricing.

Problems with social exclusion, the modern concept of social exclusion has many definitions that implies and inability to participate fully in the life of the community, due to poverty, ill-health, unemployment, physical isolation, lack of education etc. Public transport can be limited or deficient and therefore the most vulnerable groups are at risk of social exclusion.

The introduction of road user charging gives additional choice to affluent groups but may present serious problems to those for whom the new charges represent a significant part of their available income- (Bonsall & Kelly, 2005 p 406)

It should be noted that the revenues generated from road user charging should improve the transport system and therefore provide alternative modes of transport for those who are most affected. But whether efficient revenue is generated to accommodate the alternative modes is under question.

It can be argued that car owners are generally more affluent than non-car owners, and since road charges will only be imposed on private car owners then only the more affluent members of society will be affected. Not all car owners are affluent evidence indicates that 38% of households in the lowest quintile income group have access to a car (an increase from 26% in 1985/86)- (NI budget, p407).

In a perfectly free market, drivers faced with a new charge would have the option of paying or making alternative arrangement. Whether to pay the charge and use the road which is less congested or find alternative routes. But this therefore leads to social exclusion.

Recent road pricing schemes have been criticised, many schemes in the UK and US are being cancelled, delayed or scaled back, this is mainly due to the fact that there has been major opposition and protest to these schemes. The major criticisms are that congestion pricing in general is not equitable, they have a negative effect on retail businesses and on economic activity in general, they place an economic burden on neighbouring communities and are considered as another form of tax.

But overall road pricing schemes are the future, but whether it should be implemented at a national level is still uncertain. Road pricing schemes provide huge benefits in generating revenue and limiting congestion. The major concern is how to implement them at a national level, due to costs and public acceptability.

Key road pricing schemes

London Congestion pricing

The London congestion scheme was introduced in February 2003. Since then private automobiles have been charged a fee when entering the city centre. It was devised as a way to reduce traffic congestion and raise revenues to transport improvements and since then it has achieved these goals. It was the first congestion pricing program in a major European city and has that much success that proposed schemes elsewhere are being considered.

The introduction of this scheme was essential, as central London had particular has limited road capacity and heavy travel demand this resulted in severe congestion.

The scheme introduced charges for motorists driving in central London on weekdays between 7: 00 am and 6: 30 pm are required to pay £5, which was increased to £8 in July 2005. - (Pickford, 2006 p248) It should be noted that there are exemptions for licensed taxis, motorcycles, alternative fuel vehicles, vehicles used by disabled people, buses and emergency services and residents have a 90% discount. Payment can be made at retail outlets, payment machines located in the area, by internet, telephone or SMS messaging. Motorists can purchase weekly, monthly passes with 15% discount. 'Discounted and exempt users total 30% of traffic, 39, 000 vehicles a day. - (Pickford, 2006 p248) Figure 1 shows the London Congested Charging Area.

(Figure 2: London Congestion Charging Area, Litman 2011, p2)

There are a network of cameras operating throughout the congestion charging zone, recording the license plate numbers of vehicles and matches it with the paid list. If they have not paid the congestion charge then they are sent a £80 fine. This fine is reduced to £40 if paid within 2 weeks. These measures are brought in to ensure that everyone pays the charges and that everyone is treated fairly.

The scheme has had a significant effect on the quality of life and travel in Central London. Overall congestion was reduced by 30% and bus congestion delays declined 50%. Traffic entering the charging zone has been reduced by 18% and car trips by 35%. - (Pickford, 2006 p250)

Between 2000 and 2008 start up costs and operating costs were £500 million but the charge and penalty revenue generated £800 million, leaving £300 million,- (Litman, 2011 p 5) which by law must be reinvested into transport improvements in London.

It should be noted there are many problems with the London congestion charging scheme, with complaints coming from the lack of system accuracy with motorists being wrongly ticked. Some motorists believe that they are being 'double charged' by paying registration and fuel taxes and this affects low-income motorists the most. Also some motorists believe that there is a loss of privacy with the video cameras and the system tracking their vehicles.

Singapore

When looking at road pricing schemes Singapore is considered to have the most successful schemes and is a benchmark for other cities. Road pricing <https://assignbuster.com/the-electronic-road-pricing-in-singapore-economics-essay/>

was introduced in Singapore in June 1975 with the highly effective Area Licensing Scheme (ALS) and the Road Pricing Scheme (RPS) these are considered as manual road pricing schemes. Many changes have been made to the road pricing scheme since then, mainly with the introduction of the Electronic Road Pricing System (ERP).

Singapore introduced ERP in 1997 as problems were evolving with the manual road pricing schemes.

The ERP scheme involved installing a Dedicated Short-Range Communication (DSRC) that included as In-vehicle Unit (IVU) with a smart card. Permanent IVUs are installed on all domestic vehicles, while foreign vehicles may use temporary IVUs.

Two overhead gantries, located close to each other, are placed over every entry point. They carry antennas. Every time a vehicle passes through an entry point the antenna interrogates the IVU in the vehicle, verifies its validity, and instructs it to deduct an appropriate entry charge from the stored value of a smart card inserted in the IVU.

If there is insufficient cash in the smart card or should there be no smart card in the IVU, the enforcement cameras will take a picture of the vehicle's licence plate.

In May 1998, with 98% of registered vehicle owners having an IVU installed. The scheme launched with an administrative charge of S\$10 for drivers who failed to maintain a balance on their smart card. - ((Pickford, 2006 p247)

From introducing the ERP the traffic volume into the Central Business district (CBD) has reduced by about 10-15% during ERP operation hours compared to the ALS scheme- (Keong 2002, p8). The ERP system allowed more frequent changes to be made to the road pricing charges, so that it can better optimise road usage.

Privacy issues is a concern, with records of their transactions being kept and can track motorist's location and travel patterns.

Overall road pricing in Singapore has been effective in managing congestion on roads in the CBD since its inception 1975. Through the ALS and RPS schemes, Singapore showed it was possible to introduce a large scale ERP scheme in a congested business district and make it work with technology that was just emerging in the mass market. This successful scheme has demonstrated that charging is a powerful demand management tool that is able to balance traffic on different routes to achieve optimum flow.

Current legislation in the UK

In the UK, central government has laid down a legislative framework to allow local transport authorities to undertake charging scheme. The principle items of legislation are:

The Greater London Authority Act 1999

The Transport Act 2000

The transport (Scotland) Act 2005

There is no equivalent legislation for Northern Ireland

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The main aspect of this legislation permits local authorities to undertake charging in furtherance of the objectives of their local transport plans, this includes revenue generated from charging to be invested into transport improvements for at least the first ten years of a charging scheme, provided that schemes are initiated within ten years to the 2000 Act, although this Act does provide for this ten year deadline to be varied by regulation.

The central government is also responsible for legislation on privacy and data protection, although the principle legislation- the 'Human Rights Act 2000' and the 'Data Protection Act 1998'.

The devolved administrations are responsible for the administration of roads. Under the current administrative framework there is separate legislation for Scotland- (The transport Scotland Act 1999) and (The Roads NI Order 1993) - which governs the administration of roads in Northern Ireland, while the Transport Act 2000 applies to England and Wales.

This division means that the responsibilities have been divided. Local authorities have the power to create a charging scheme as long as the scheme has been approved by the Secretary of State. The purpose of the charging scheme is then described, and application of revenues is set out in the primary legislation and acts as a clear constraint in local authority initiatives. The local authorities have the power to make operation decisions with the proposed scheme and there is no obligation for them to adopt a common approach or methodology for the scheme of for assessing costs and benefits.

When looking at the Transport Act 2000, section 163. Part 2

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It states that charges imposed in respect of any motor vehicle by a charging scheme under shall be paid-

By the registered keeper of the motor vehicle or,

In circumstance specified in regulation made by the appropriate national authority, by such person as is so specified.

Part 3- A charging scheme may be made-

by a non-metropolitan local traffic authority (" a local charging scheme"),

jointly by more than one non-metropolitan local traffic authority (" a joint local charging scheme"),

jointly by one or more non-metropolitan local traffic authorities and one or more London traffic authorities (" a joint local-London charging scheme"), or

By the Secretary of State or the National Assembly for Wales (" a trunk road charging scheme").

The UK government are looking to the future, in terms of a national road pricing scheme. The Department for Transport claim that if there was a national road pricing scheme then the central government would act as an advocate for charging , through providing a legislative and wider framework to a practical delivery role- (2006, p36). It also states that locally-based schemes will pave the way for a national scheme, 'there is a clear need for the central Government to have powers to initiate work by local authorities,

while recognising local needs, and to ensure that local transport objectives are not hampered' (2006, p37)

Overall to deliver an effective system of road charging, one that delivers real benefits to motorists and to the environment, that has both political and public consensus. There needs to be a change in how the local and central government work together across the tiers of government. Until then the central government encourages and supports the need for the local authorities to develop new road pricing schemes, that are subject to proper appraisal and review and can be easily understood to protect the vehicle user.

Conclusion

In conclusion road pricing schemes are the way forward, as other alternatives involve expanding the road infrastructure, this will result in higher congestion and co2 emission. This report has looked at the concept of road pricing and the different types of road pricing schemes and analyzed the advantages and disadvantages of them. In conclusion the advantages outweigh the disadvantages. Evidence has been seen from the case studies that efficient, proper and well implemented schemes can provide huge benefits to the local transportation system.

Northern Ireland, particularly Belfast suffers from high congestion problems, but there is current no legislation for Northern Ireland regarding road pricing schemes. Northern Ireland must implement road pricing schemes as they will provide revenue for the local transportation system and lower co2 emissions.

Many parts of the UK also don't have road pricing schemes. There is major congestion at peak hours in most cities in the UK. A proper evaluation of the costs of congestion and an understanding of the impact congestion has on the UK economy is needed. Eddington talks about a national road pricing scheme by 2015 to deal with the extremely high levels of congestion.

A National road pricing system needs to be put in place as it will provide the opportunity for a whole-scale change in the way we pay for the road use. If road pricing were to be introduced at a national level then it will set targets, which would include reduce congestion, climate change emissions etc.

However if the government were to commit to implementing national road pricing, there must be evidence to show that the scheme would be effective, fair and value for money. However, road pricing on this scale is new and at this stage has unknown implementation costs. There are very significant risks and uncertainties involved in delivering a pricing policy, particularly around the technology needed for its delivery: potential technologies exist but have never been used at a national level also concerns about equity and public acceptability, as well as the likelihood that the reduction in congestion brought about by road pricing would be undone by induced traffic.

Biography

Travel demand management and road user pricing : success, failure and feasibility / edited by Wafaa Saleh, G