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Congestion Pricing

Myths and Realities

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Congestion Pricing: Myths and Realities[∃]

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Abstract

The paper discusses ten myths and misconceptions surrounding congestion pricing policies. Although versions of road pricing in the form of HOT lanes are not necessarily consistent with the goals of Smart Growth, the true congestion pricing is likely to largely adhere to its major principles.
However, congestion pricing is not a panacea and will likely lead to welfare improvements ranging from modest to moderate.

Keywords: Smart Growth, Congestion Pricing, HOT lanes, revenue recycling

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1. Introduction

Smart Growth refers to development principles and planning practices that intend to create more efficient land use and transportation patterns in urban areas. Although over the years the emphasis of the smart growth has been changing, it is much better embedded in principles of Smart Growth rather than a set of particular policies. While the ideas of Smart Growth present a coherent picture of the resulting urban environment, particular tools and implementation strategies that can be used to achieve such goals widely vary and include both planning practices and policies. Among policies, there are both non-market and market-oriented policies.

1.1. Congestion Pricing in the World

Congestion pricing has been advocated by transportation economists for more than fifty years. Following William Vickrey's works (1959, 1963) they advocated internalizing congestion externality in urban areas by imposing congestion taxes equal to the marginal costs imposed by one driver on the road on others. However, as a practical matter, congestion pricing has been criticized on many grounds – it was politically hard to adopt, it was technically infeasible and too costly to implement, it was politically hard to move forward since it was considered a new tax and was believed to hurt the poor. A number of experts have predicted that road pricing will never be wide-spread[1].

In the next several decades not much has been happening. Although the results of Hong Kong's congestion pricing experiment and the increasingly refined congestion-pricing schemes employed in Singapore were widely discussed and several Norwegian cities had implemented cordon tolls, the developments in the rest of the

[1] see, e.g. Giuliano (1992), Gillen (1997), Small and Gomez-Ibanez(1999)

world were quite slow. The highly visible 2003 London area pricing experiment has been more successful than most experts predicted. It had succeeded in substantially reducing the level of auto congestion in central London without a noticeable increase in congestion outside of the pricing area. The success of the London experiment has prompted many cities around the world to initiate discussions and planning for congestion pricing. Later on pricing has been implemented in Rome and Stockholm, and in February 2007 the initial pricing area in London was doubled.

In the US most operational projects up to date feature High Occupancy/ Toll (HOT) lanes.[2] HOT lanes are a variant of High Occupancy Vehicle (HOV) lanes that allow vehicles carrying fewer people than the HOV occupancy requirement to use the lanes if they pay a toll. General purpose toll-free lanes run parallel to the HOT lanes. The HOT lanes on State Route 91 (Orange County, CA) built in 1995, HOT lanes on Interstate 15 (San Diego) converted from HOV lanes in 1997 and a HOT lane on Katy Freeway (I-10) in Houston launched in 1998 were the first projects. The first two projects were extensively studied in transportation economics literature[3]. They were followed by HOT lanes on Northwest Freeway (US 290) in Houston opened in 2000, a newly constructed HOT lanes in I-394 in Minneapolis in 2005 and HOT lanes in Denver opened in 2006. Several other HOT Lane type projects are under construction.

The pieces of federal legislation: the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and the Transportation Equity Act for the 21st Century (TEA-21) played an important role in those developments. TEA-21 authorized the Value Pricing Pilot Program (VPPP) to fund innovative road and parking pricing measures for alleviating congestion, and permitted limited tolling on Interstate highways. The VPPP was renewed with the passage in August 2005 of the Safe, Accountable,

[2] the only exception is a series of tolled bridges around Fort Myers Beach, Florida that essentially resemble a cordon

[3] see, e.g., Lam and Small (2001), Brownstone and Small (2005)

Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). SAFETEA-LU provided a total of $59 million for fiscal years (FY) 2005-2009 for the VPP program. $11 million was authorized for FY 2005 and $12 million was authorized for each of FYs 2006 through 2009. Of the amounts made available to carry out the program, $3 million will be set-aside in each of the fiscal years 2006 through 2009 for value pricing projects that do not involve highway tolls. Funds available for the VPP program can be used to support pre-implementation study activities and to pay for implementation costs of value pricing projects.

Value pricing concepts that have become mainstream and have been adopted, as common practice, such as High Occupancy Vehicle (HOV)-to-High Occupancy Toll (HOT) lane conversions, are no longer eligible for funding under SAFETEA-LU. However, as of today, HOT lanes remain the dominant form of congestion pricing in the US. Several urban areas (San Francisco, Boston and, most recently, New York City) have at one point attempted studies of urban area pricing (as opposed to facility pricing), but have not been successful in promoting this cause much further.[4]

Therefore, the issue of the design of road pricing schemes for the future remains. On the one hand, there were several proposals that introduced network-based schemes. Networks of toll roads have some attractive properties. They embody scale economies for users and there are likely to be scale economies in toll collection, for both users and operators. However, at present toll networks are facing multiple regulatory hurdles.

1.2. Road Pricing in Maryland

[4] New York City's cordon-like congestion pricing scheme was one of the finalists of the 2007 Urban Partnerships Program and is still under consideration

In Maryland essentially the same concept of HOT lanes is being marketed under the name Optional Express Toll Lanes. The idea is that, to reflect the value pricing idea, those lanes will be optional, but because they are express, the users will have to pay a toll. In the future, such lanes are supposed to form a rather dense network (see Figure xx). However, at the moment only two segments (a 10-mile segment of I-95 to the north from I-895 and the Intercounty Connector (ICC) – an 18-mile toll road from I-270 to I-95) are under construction. Four more Facilities – the entire Maryland portion of the Capital Beltway, I-270, a 9.4-mile segment of MD-5 and one more 10-mile segment of I-95 north of the Baltimore – are at the project planning stages.

The planned tolled roads will be equipped with 100-percent electronic toll collection facilities with toll collection conducted at highway speeds. On all roads the toll level will be varying with the level of congestion on a real-time schedule to provide express travelers with a premium service.

The revenue recycling plan associated with the express lanes is that the toll revenue will be used to pay for the capital costs of the network construction.

1.3. Smart Growth and Congestion Pricing

Smart Growth movement has identified major principles and goals of urban development that are generally consistent with the smart urban development. However, specific planning, regulatory and fiscal practices that can achieve the ideal are rarely specified. At best, the Smart growth literature offers lists of specific implementation strategies that have been applied in the past in particular urban areas. The general idea is that the larger set of smart growth policies an urban area would be able to embrace, the better and "smarter" outcomes it should expect.

On those lists, congestion pricing has a special place. On the one hand, congestion pricing seems to be largely consistent with the big principles of Smart Growth. By internalizing transportation externalities causing excessive traffic congestion in the first place, congestion pricing is supposed to eliminate one of the important causes of urban sprawl. Moreover, by making auto trips marginally more expensive, congestion pricing is likely to make alternative transportation options in urban areas, such as transit and walking, more viable. Nevertheless, only some of the proponents of Smart growth acknowledge road pricing among acceptable practices.

At the same time, the opponents of Smart Growth often recommend congestion pricing as a policy preferable to more restrictive and direct policies such as urban growth boundaries.[5]

Even if congestion pricing is not an integral part of the Smart Growth strategies, the latter should be developed keeping the presence of the former in mind. Congestion pricing has entered the political arena and is likely to keep its presence for years to come. Smart Growth movement in Maryland (and elsewhere) for the next 10 years should be aware of congestion pricing and develop its own strategies accordingly.

2. Ten Myths about Congestion Pricing

There are several wide-spread myths about traffic congestion and congestion pricing that are often presented in the popular literature and mass media. Many of them have originated in research; others are a product of the imagination of casual observers, and yet others are seemingly logical conclusions where logic is applied erroneously. Regardless of their origin, those myths seem to be widely accepted and therefore often affect the way the public thinks about congestion pricing and the way

[5] see, e.g. Cox(2002)

the public policy is formulated by the policymakers. Therefore, they are not just innocent misconceptions about the true effects of congestion pricing, but can pose a danger of formulation and implementation of policies that might end up being either ineffective or even harmful.

In this paper we will describe those myths and provide a reality check. Most of the examples in the reality check are based on the previous research done by the authors and in most cases is based on studies performed using the transportation/ land use simulation model LUSTRE[6]. Because LUSTRE model is calibrated for Washington, DC metro area many examples are based on simulations done for suburban Maryland.

Myth 1: The costs of congestion are astronomical

The statistics reported annually by the Texas Transportation Institute (TTI) compare the costs of congestion by individual metro areas. In 2003, residents of the large US metropolitan areas spent 47 hours a year sitting in the traffic jams. Overall, Americans were delayed about 3.7 billion hours and used 2.3 billion extra gallons of fuel in stop-and-go traffic.

Those large numbers lead us to believe that, first of all, urban traffic congestion is a serious problem that has to be addressed. Second, since the costs of congestion are so large, practically any effective congestion reduction policy will automatically produce large benefits.

Let us first examine the methodology used by the researchers at TTI[7]. The number of hours spent in traffic jams is computed as the difference in travel times between the actual travel times and the travel times under so-called free flow speeds. The free flow speeds are the speeds at which the cars would travel in the complete absence of

[6] For more information about LUSTRE model, see Safirova et al 2006 a, Houde et al 2007.
[7] The TTI methodology is useful for specific tasks, such as inter-metropolitan congestion and tracking the dynamics of congestion for the same metro area.

congestion. This is an ideal state that cannot be achieved in the real world. However, if one would have attempted to approximate those ideal traffic conditions in the real world, it would require a significant overprovision of road capacity. Since the provision of road capacity at the level required to approximate free flow conditions would be extremely costly, using the free flow speeds as a benchmark is misleading and tends to inflate the costs of congestion.

The reality is that when economic costs of roads are taken into account, even in the best of circumstances the road congestion will not disappear. The net benefits of implementing a policy strategy intended to reduce congestion, such as congestion pricing, would be even lower. For example, Table 2 shows net benefits of implementing a series of somewhat different congestion pricing policies for the Washington, DC metro area. The long-term benefits from implementing such policies amount to not much more than several tens of dollars per person annually.

This is not to say that congestion pricing should not be implemented. However, the expectations should not be that congestion pricing is likely to produce enormous benefits.

Myth 2: Congestion Pricing should be implemented only in the pockets high congestion.

Virtually all congestion pricing schemes that are either in place or are being seriously considered are very fragmented. The most common forms of pricing are either area pricing (London-style) or facility pricing. Both types of schemes are pricing access to only a very small range of road facilities that are most highly congested.

At the first glance, such approach makes sense. Implementation of congestion pricing is costly and pricing the roads with low congestion seems to be a waste of

resources. Moreover, pricing has to start somewhere, and starting small with individual facility pricing is a logical way to go.

On further consideration, urban transportation networks are good "conductors" of congestion. Several studies show that congestion proliferation can be quite significant. The take home message is that congestion proliferation effect should be taken into account when designing a localized road pricing strategy. This suggests that pricing policy can not be overly localized. In many cases, coordination between adjacent jurisdiction may be required to design an effective policy.

Myth 3: Congestion pricing will encourage residents to move closer to the city center

This myth is brought in by the logic of the monocentric city model. Indeed, in highly stylized urban monocentric city models congestion pricing of the radial system of the roadways unambiguously leads to higher rents all over the city, smaller city footprint, higher residential density and effectively makes the residents move closer to the city center.[8]

On further consideration, when both residential and workplace patterns are dispersed, congestion pricing can lead to both a movement of residents toward the center of the city and outwards. The relative intensity of the movements would depend on particular details of spatial configuration. For example, in our simulation study of cordon-type congestion pricing for Washington, DC we observed both movements (see Safirova et al (2006a) for details).

Myth 4: HOT lanes are a type of congestion pricing

The most popular form of road pricing in the US so far has been pricing one lane at a time in the form of HOT lanes. There are several explanations why this form of

[8] see, e.g. Brueckner (2005)

pricing has been dominating. On the one hand, the proliferation of HOV lanes on US roads made conversion of HOV lanes into HOT lanes a relatively easy task. Another way of creating HOV lanes is a construction of a new HOT lane as an addition to a highway containing general purpose lanes.

On further consideration, although HOT lanes are an acceptable form of pricing and a form of transport demand management, they are not necessarily a form of congestion pricing. By leaving a substantial number of trips unpriced, HOT lanes and other similar forms of value pricing might have a very different incentive structure than the true congestion pricing. For example, when HOT lanes are formed as a conversion from the HOV lanes, the share of solo trips is increasing and modal shares of transit and other alternative transportation modes is decreasing.[9]

Myth 5: Investment in transit and congestion pricing are complementary

It has been suggested in the literature that congestion pricing would make urban transit more attractive. Because urban public transit exhibits a high degree of economies of scale, congestion pricing at the margin affects the decision-making related to the mode choice and increases viability of transit. In fact, this is precisely this synergy that has been exploited in London Area Pricing Scheme[10].

However, such predictions were made based on simple theoretical models where urban transit was modeled as a stylized bus service. In our simulations of simultaneous road pricing and transit service expansion where both bus and rail service were present and time periods of travel as well as the urban spatial structure were taken into account, the effect of synergies between congestion pricing and transit

[9] see Safirova et al (2004) for details
[10] see Small (2004) for a formal model

expansion was much less pronounced. This finding makes re-investment of road pricing revenues in public transit less attractive, based purely on efficiency grounds.

Myth 6: Toll revenue from congestion pricing can be used to finance new roads

The idea that toll revenue collection can be used to finance roads has been an impetus for many HOT lane projects and is driving public acceptability of the Express lanes in Maryland.

However, on further consideration, there are two important factors. First, the revenue alone is likely to fall far short of the full costs of road construction. For example, the toll collection from a hypothetical cordon toll in Washington, DC ranges between $91 and $111 million annually. Secondly, spending revenue on new road construction could aggravate equity impact of the pricing scheme.

Myth 7: Low Income travelers would prefer low tolls while high income travelers would choose high tolls

The popular press often portrays road tolls as a highly inequitable measure, a type of Lexus Lane that is likely to benefit high income drivers at the expense of travelers of modest means. To be sure, the exact equity impact of any road pricing scheme heavily depends on how the toll revenues are recycled.

However, if we assume that the revenues are returned to all travelers in equal proportions (similar schemes have been proposed and are called Credit-Based Road Pricing), the results would be quite different from the popular beliefs. In fact, under such distribution scheme, low-income travelers would prefer high toll levels, while high-income travelers will be better –off under low tolls.[11]

Myth 8: Congestion pricing always leads to welfare improvements

[11] see Safirova et al (2006a) for details

This claim is usually associated with simple theoretical models of congestion. In such models, it is assumed that there are no other externalities in the system. However, if other externalities are present, the welfare improvements depend on relative strength of congestion externality and other present externality. There are two examples of such situation. One of them is related to the presence of taxes, in particular labor taxes. It turns out that when congestion tolls and income (labor) taxes are levied simultaneously, it is preferable to eliminate congestion tolls unless it is possible to use the toll revenue to reduce labor taxes first.

The other example is about the presence of agglomeration economies. When the proximity of economic agents to each other creates strong agglomeration effects (a Silicon Valley phenomenon), imposition of a congestion tolls might lead to an inferior outcome. Under such circumstances, regardless of the purely transportation situation the economy will be better of when congestion externality stays unpriced.

Myth 9: Congestion pricing is the same as road pricing

In popular media terms congestion pricing and road pricing are often used interchangeably. However, road pricing is generally a much broader term and might mean pricing for a variety of different purposes. In the past, the most common use of road tolls was purely revenue collection. Although any road tolls reduce traffic compared to untolled roads, the degree and especially the structure of reductions can vary drastically. Moreover, under certain conditions value pricing can even increase the traffic flow and is therefore very different from pure congestion pricing.

Myth 10: Urban congestion and congestion pricing are strictly local matters

There are several aspects in which congestion pricing cannot stay local. One of them has been mentioned in Myth 2 – using highly localized pricing schemes might drive congestion outside of the initially priced areas to clog the unpriced roads. However,

pricing networks might run into a set of additional complications such as inter-jurisdictional competition around road pricing. An example of such competition can be observed in Washington, DC metro area between road pricing strategies employed by Maryland and Virginia.

3. Conclusions

The concepts of congestion pricing, road pricing and value pricing are often used interchangeably. From the political standpoint, value pricing seems to be the most attractive to the public and therefore appears to be easier to implement. There is a hope that various forms of value pricing would expose the travelers to the ideas of road pricing and would make them more accepting of stricter forms of pricing, such as more rigorous and in principle more efficient congestion pricing. However, there is a danger that value pricing might become a dominant form of road pricing that will be hard to replace later.

Although a straightforward congestion pricing is largely consistent with the goals and principles of Smart Growth, the same is not true about value pricing and road pricing in general. Moreover, even the benefits from the true congestion pricing are likely to be quite modest and therefore require careful planning and coordination with other policies.

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