



Car restraint policies and mileage in Singapore



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ABSTRACT

Negative externalities often surface after policies are implemented. This paper analyses how two “hard” Travel Demand Management (TDM) policies implemented in Singapore to target vehicle ownership and road usage may contribute to a negative externality namely excessive mileage accumulation. This has implications on resource depletion such as petrol wastage, higher CO₂ emission and losses in time and productivity. Vehicle ownership in Singapore is managed firstly via the requirement to bid for a Certificate of Entitlement (COE) which entitles the usage of local roads and secondly via the payment of an Additional Registration Fee (ARF) which is refundable between 75% and 50% to incentivise the de-registration of a vehicle before it is 10 years old. Such deregistered vehicles may also be eligible for a COE refund between 0% and 80% depending on age. The COE and ARF costs are significant as they typically account for more than half the purchase price of a vehicle. Furthermore, road usage is subject to Electronic Road Pricing (ERP) fees on busy segments. A sample of over 8700 used cars is analysed to infer the effects of the non-refundable (or “sunk”) and the “variable” portions of the combined cost of COE and ARF as well as the number of ERP gantries on mileage over and above traditional factors such as petrol price and engine size. The findings suggest tweaks to the TDM policies to reduce mileage and its negative implications.

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1. Introduction

Singapore stands out with its travel demand management (TDM) strategy wherein restraint policies targeting the ownership and usage of cars are integrated with a convenient and affordable public transportation system comprising mass rapid transit, busses and taxis. Beyond the alleviation of congestion, TDM should also be gauged on other impacts. This paper contributes in that direction by studying a negative externality of the car restraint policies, namely mileage accumulation and its impacts on the environment and the economy.

In 1975, the South East Asian city-state pioneered a manual Area Licensing Scheme (ALS) to manage congestion into its Central Business District (CBD). The road usage restraint tool which was extended to some busy highways in 1995 then evolved into Electronic Road Pricing (ERP) by 1998. Concurrently, Singapore launched the Certificate of Entitlement (COE) scheme in 1992 to manage vehicle ownership via an auction of licenses. A COE license entitles a vehicle to use the roads for a period of 10 years and it may be renewed at prevailing rates thereafter. Any un-used portion of the COE is refundable according to age. The refund ranges between 80% (for vehicles deregistered before 2 years of age) and 0% (for vehicles deregistered at 10 years of age). An additional ownership restraint measure introduced in 1975 was the Additional Registration Fee (ARF) tagged to the import value of vehicles. Its objective was to keep the fleet modern and efficient and it currently does so via a graduated 75% to 50% refund for vehicles de-registered before the age of 10 years.

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Surveys from mandatory periodic vehicle inspections carried out in 2012–13 indicate mean annual mileage of about 18,000 km for private cars in Singapore. Kenworthy and Laube (2001) observed that car usage in Singapore was much higher than in Hong Kong and Tokyo, peer Asian cities which have similarly deployed efficient public transit to contain private vehicle ownership and usage, but comparable to Oslo and Copenhagen which shared the similarity of high vehicle purchase taxes. Choi and Toh (2010) rate Singapore's average annual car mileage as comparable to similarly-sized Chicago City. De Jong (1990) inferred from micro-simulations of an economic utility model that mileage accumulated more from higher fixed costs (i.e. insurance fees, road tax, depreciation) rather than variable (i.e. fuel, oil, and repair) costs. Do the mileage statistics in Singapore align with this hypothesis?

This paper uses a sample of over 8700 different used cars advertised for resale in 2011–2012 to investigate the following research agenda. Did the presence of between 45 and 80 ERP gantries during the study period motivate car drivers to use them (against current per-entry charges ranging between \$0.50¹ and \$6.00) and thereby save on time, mileage and petrol? Did the substantial amount of money paid for a scarce COE (ranging between \$2 and \$78,001 with an average about \$18,000 in the sample) and the ARF (ranging between \$7570 and \$192,662 with an average about \$32,300 in the sample) influence car owners to drive more in order to capitalize on their additional cost or did it rather influence them to drive less in order to keep their car for the long haul? These investigations go beyond Ho et al. (2014) who investigate from a behavioural economics perspective the effect of the combined “sunk cost” (i.e. the respective 20% and 25% non-refundable portions) of COE and ARF on mileage and Cameron et al. (2004) which commented on the impact of ALS and the early days of the COE implementation in their comparative study of vehicle kilometres of travel across diverse cities worldwide. The empirical findings uncovered in this paper should be of interest to the transportation literature and to policy makers evaluating TDM options.

TDM is looming larger on the transportation research radar. TDM tools (e.g. Meyer (1999), Bamberg et al. (2011) and the references therein) are segregated as “soft” (e.g. campaigns to promote walking, cycling, public transit, teleworking, car clubs etc.) or “hard” (e.g. road pricing, heavy investment to provide convenient and affordable public transport etc.). In Singapore, the most notable “soft” TDM experiment started in June 2013. It accorded free Mass Rapid Transit transportation when exiting selected stations in the CBD area by 7.45am. This has to date shifted passenger movement by about 7%.² One reason cited for this muted outcome against an expectation of 15–20% is the lack of progress in implementing flexible working hours. This and other practical reasons which make walking and cycling a sweaty trip in the equatorial climate as well as a service economy requiring frequent human contacts which limit the practicality of teleworking or car clubs have influenced Singapore to opt for “hard” TDM tools targeting vehicle ownership and road usage.

There is a growing consensus that the efficacy and sustainability of roads lie in usage management rather than in capacity building. Special journal issues edited by Saleh (2007) and Eliasson et al. (2009) have highlighted congestion pricing as the most effective TDM “hard” tool when its objectives are clearly communicated, the pricing mechanism is equitable with net revenues flowing back to the community, the public given a trial experience and viable alternatives such as effective public transit and faultless execution as exemplified in Stockholm in 2007. These “best practices”, also inferred among others in Hensher and Puckett (2007), Schuitema et al. (2010), Noordegraaf et al. (2014) and Sørensen et al. (2014) reflect earlier survey findings which identify public acceptance as the key roadblock to congestion pricing e.g. Harrington et al. (2001) which report positive shifts in support when the public was made aware that it would benefit from net revenues and that it had payment-free road options to bypass the TDM “hard” measures.

Strategically located at the tip of South East Asia, tiny Singapore embarked on an economic development program in 1961 and that became a critical strategy for survival following its separation from Malaysia in 1965. Hard work and discipline have propelled the city-state from third to first world status in one generation. Between 1975 and 2013, the population count rose from 2.3 m to 5.4 m while the GDP (at 2010 market prices) leapt from about \$29 b to \$364 b. The road network has been expanded to its optimum and today it covers a sizeable 12% (compared to say 15% for housing) of the land span of about 710 km². These statistics highlight the background which led Singapore to reckon roads as a scarce resource and thereby resort pragmatically to “hard” TDM policies to tackle congestion. These policies were deemed necessary to sustain economic growth and collaterally to curb road usage (i.e. ERP) and vehicle ownership (i.e. COE and ARF) arising from growing affluence. Creditably, Singapore followed most “best practices” listed above e.g. investing heavily in an effective public transit comprising busses, MRT and taxis and extensive public discussion (but no trial experience) ahead of the implantation of the car ownership and usage restraint measures.

The road map of the paper is as follows. The next section provides the background on “hard” car-centric TDM tools used in Singapore namely ERP, COE and ARF. Section 3 develops a regression model to infer the influence of these TDM schemes over and above factors such as age, engine size, petrol price and ownership history on the mileage of a sample of over 8700 used cars. The paper concludes with a discussion of the findings and it also provides suggestions to tweak the car-centric TDM policies in order to reduce mileage accumulation.

2. Car-centric TDM tools in Singapore

“The problem of traffic congestion reached a peak in early 1975 when average vehicular speeds during the morning and evening rush hours within the Central Business District was only 19 km/h” extracted from Phang and Toh (1997) succinctly

¹ Singapore dollar is used throughout the paper. In January 2015, 1 Singapore dollar ~0.75 US dollar.

² <http://www.lta.gov.sg/apps/news/page.aspx?c=2&id=e96f7b3a-67dd-4588-9fd9-d115472cf9b0>, accessed January 2015.

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