

APPENDIX B

LITERATURE REVIEW

INTRODUCTION

This appendix summarizes a review of the existing literature on taxi services. Topics covered include the regulatory environment, such as entry controls and fare setting; measures to improve service quality; and the integration of taxis into the overall transportation system, such as through shared rides.

The focus of the review here is guided to a large extent by that of the literature available. To a great extent, this concentrates on regulation, both in theoretical terms and through empirical evidence from cities that have regulated or deregulated. Far less literature is available on issues such as how taxis can be integrated with other modes of transport, and central dispatch systems.

The literature discussed here is primarily focused on the United States and, to a lesser extent, Canada. However, where relevant, experiences in Europe and Australia are also drawn upon. No attempt is made in this chapter to review the literature that focuses on San Francisco, such as the report of the Mayor's Taxi Task Force. These documents are considered elsewhere in this report.

In order to focus on the more contemporary, relevant contributions, virtually all the literature reviewed dates from 1990 or later.

Figure 1 summarizes the sources that were reviewed, giving brief details of the subjects covered and key points. A more comprehensive summary of each source is given in Appendix H, available from SPUR under separate cover.

Figure 1 Summary of Literature Considered

Title	Author(s)	Publication or Conference (if any)	Year	Subject	Key points	Relevance
A study of the taxi industry in British Columbia, Report to the Minister of Transportation and Highways	British Columbia Taxi Study Panel	www.th.gov.bc.ca/bchighways/taxi/taxi.htm	1999	Study of the financial condition of the industry, the regulatory scheme and service quality	Recommendations included development of shared-ride services, automatic fare reviews, the inclusion of the taxi industry in public transportation planning, more stringent driver training, and a 'merit lottery' for drivers who cannot afford licenses	key
Taxicab Regulation in Ohio's Largest Cities	Buckeye Institute		1996	Taxi regulation in Ohio	A large number of regulations stifle competition and discourage new companies from entering the market. They severely limit competition on price and service grounds. These regulations include fare regulation and requirements on the minimum size of each firm, for 24/7 service and separate dispatch offices, and to show proof of public need for new services. In deregulated cities, the supply of taxis has increased.	key
How to make regulation work	Gilbert, Gorman	International Conference on Taxi Regulation, Montreal	1992	Broad overview of need for taxi regulation	The Los Angeles franchise system has simplified regulation and improved service.	key
Factors of production in a regulated industry: New York taxi drivers and the price for better service	Schaller, Bruce and Gilbert, Gorman	Transportation Quarterly, 49(4)	1995	Service quality in New York City	The root causes of poor service are inadequate wages and working conditions for drivers, which lead to high turnover. Therefore, the key to improving service is to increase the number of experienced drivers, who are far less likely to attract complaints. The leasing system is a major cause of low driver incomes.	key

Title	Author(s)	Publication or Conference (if any)	Year	Subject	Key points	Relevance
Villain or Bogyman? New York's Taxi Medallion System	Schaller, Bruce and Gilbert, Gorman	Transportation Quarterly, 50(1)	1996	Medallion system and competition in New York City	It is taxicab leasing, rather than simply the medallion system, which is most to blame for poor working conditions and service quality. Competition does not lead to better service, as passengers hailing a cab on the street have no way of comparing service quality.	key
An overview of the American experience with taxi deregulation	Teal, Roger	International Conference on Taxi Regulation, Montreal	1992	Taxi deregulation in the US.	Deregulation in US cities has not lead to significant consumer benefits. Fare levels increased more in deregulation cities, and no new innovative services were established. The failure of deregulation was probably due to low entry costs into the market.	key
Report to review the Toronto Taxi Industry	Toronto Task Force to Review the Taxi Industry	www.taxi-l.org/tor98-01.htm	1998	Taxi reform in Toronto	Recommends creating a 'Taxicab Passenger Bill of Rights', setting out clear standards as a point of reference for drivers and passengers. Other recommendations include the creation of a premium class of "Ambassador Taxis", more stringent training, an evening surcharge to improve availability at night, and restriction of all new licenses for owner-drivers only.	key

Title	Author(s)	Publication or Conference (if any)	Year	Subject	Key points	Relevance
Peer review of Seattle Taxicab Regulations. Report for the City of Seattle	Avants, Sandi; Gilbert, Gorman; and Lupro, Barbara	http://www.pan.ci.seattle.wa.us/seattle/leg/drago/peer1.htm	1996	Deregulation in Seattle	The "atomized industry structure" in Seattle following deregulation has made enforcement a "nightmare", and left insufficient profits to invest in improvements. Problems include poor availability, slow response times, inconsistent fares, refusals (for short trips and because of racial discrimination) and the poor image created for visitors.	high
Home-Link: A new linked taxi service from London Transport	Bailey, Giles	European Transport Conference, Loughborough, September 1998	1998	Integration with transit	Describes a pilot scheme to provide linked taxi services to relatively isolated suburban subway stations. The aim was to stimulate off-peak demand through focusing on the whole 'door to door' journey.	high
An Economic Analysis of Taxicab Regulation in Portland, Oregon	Boroski, John and Mildner, Gerard		1998	Taxi regulation in Portland	Advocates deregulation through a system of 'property rights', with taxi stands auctioned off to individual firms. Criticizes the demand studies undertaken in Portland, as they in effect preserve the historical ratio which is 'presumed to be correct'. The rationales offered for entry regulation are dubious, it argues.	high

Title	Author(s)	Publication or Conference (if any)	Year	Subject	Key points	Relevance
Review of the Western Australian Taxi Industry. Prepared for Department of Transport, Western Australia	BSD Consultants		1999	Regulation in Western Australia	The restriction on license numbers "severely affects" peak service levels, and increases fares and waiting times. Since barriers to entry are needed to ensure service quality and maintain supply and driver income, more stringent driver training - a 3 month training course - is recommended as an alternative means of regulating entry.	high
Take any (shared) cab you like	Faber, Wim	Taxi and Livery Management, Spring 1998	1998	Shared taxi services and other developments in Europe	Several cities in Sweden have experimented with flexible fares to reflect demand at different times of day. In Antwerp and Ostend, public transit users receive a discount on the taxi fare for the return leg of their journey, for example to return home at night.	high
Demand-responsive public transport	Peterson, Bo	Public Transport International, 44(1): 6-10	1995	Shared taxi services in Europe	Shared taxis have been successful in replacing lightly used evening and night transit services in German and Austrian cities. They have also filled niche roles such as subsidized trips to rail stations in the Netherlands.	high
Analysis of Taxicab Deregulation and Reregulation	Price Waterhouse		1993	Deregulation in the US	Deregulation has neither reduced fares or improved service quality, although supply has increased. Consequently, most cities which fully deregulated taxi services have reintroduced some form of entry control.	high
Issues in fare policy. Case of the New York taxi industry	Schaller, Bruce	Transportation Research Record 1618	1998	Setting fare levels	Fare increases in New York City have not improved vehicle standards or driver incomes. They have helped to cut demand, and thus increase the availability of taxis.	high

Title	Author(s)	Publication or Conference (if any)	Year	Subject	Key points	Relevance
Elasticities for taxicab fares and service availability	Schaller, Bruce	www.schallerconsult.com	1999	Elasticities for fares and taxi availability in New York City	As demand is elastic with respect to supply (taxi availability), taxi numbers can be increased without reducing the income of existing operators. Taxi operators often work shorter hours when demand rises, as they reach their target income more quickly. Service availability is a function of economic activity (through its impact on demand), fares and supply.	high
Taxis and Transportation Policy in New York	Schaller, Bruce	New York Transportation Journal, Summer/Fall 2000. www.schallerconsult.com	2000	Taxi regulation in New York City	"It makes no sense to allocate taxi service through excessive waiting 'costs' [for passengers] because doing so degrades an essential attribute of the service – its convenience and speediness. Much more sensible is to either allocate the service through higher fares or to satisfy higher demand by increasing the supply of service, e.g. issuing additional medallion licenses."	high
Fixing New York City Taxi Service	Schaller, Bruce and Gilbert, Gorman	Transportation Quarterly, 50(2)	1996	Policies to improve service in New York City	Sets out a range of options to improve service quality, including abolishing leasing of medallions, legalizing street hails for for-hire vehicles, and lifting the cap on medallion numbers.	high
Shared taxi schemes in Britain: lessons learned in Ipswich	Transport and Road Research Laboratory	TRRL Research Report 292	1990	Shared taxi schemes	The failure of a shared taxi scheme in Ipswich, England, was due to poor marketing and organization, rather than any fundamental obstacles to taxi sharing.	high

Title	Author(s)	Publication or Conference (if any)	Year	Subject	Key points	Relevance
Taxi regulation and the Quebec experience	Trudel, Michael	TR News 197 (July/August), pp15-19	1998	Taxi regulation in Quebec, particularly limits on license numbers and training requirements	Failure to limit license numbers can lead to lower taxi occupancy rates, higher fares, poorer service and traffic congestion. Criteria used to limit license numbers can include an arbitrary ceiling, a ratio to population or economic activity (as in Toronto), a proof of need test, franchising or through strict criteria on driver training, vehicles, etc.	high
The fundamentals of taxi regulation and the Quebec experience	Trudel, Michael	7 th Congress of the European Taxi Confederation, Spain.	1995	Training and innovation in Quebec	New markets opened up by the taxi industry in Quebec include paratransit, school transportation, sightseeing, parcel and grocery deliveries, group transportation e.g. for employers or social clubs, and a car return service for intoxicated drivers. Three professional training courses have been developed in the province, on public safety, customer service, and transportation for people with disabilities.	high
Taxi travel should be subsidised	Arnott, Richard	Journal of Urban Economics, 40: 316-333	1996	Subsidizing taxi services	To obtain the economic optimum solution, passengers should pay the marginal cost for the time the taxi is occupied. To maximize the economic benefit to society, this means taxi travel should be subsidized.	med

Title	Author(s)	Publication or Conference (if any)	Year	Subject	Key points	Relevance
Competition and regulation in the taxi industry	Cairns, Robert and Liston-Heyes, Robert	Journal of Public Economics 59:1-15	1996	Theory of taxi deregulation	In theoretical terms, deregulation is unwise, as the industry does not satisfy the conditions of competition, because passenger willingness to pay varies. There is also a social need to have services during periods of low demand, e.g. late at night.	med
A case for taxi-transit partnership	Faber, Wim	Taxi and Livery Management, January 1994	1994	Shared taxi services in Europe	Shared taxis have been introduced in many German cities to replace public transit, at times or in places of low demand.	med
The taxicab industry: theoretical and empirical evidence from (de)regulation	Gentzoglans, Anastassios	International Conference on Taxi Regulation, Montreal	1992	Broad overview of need for taxi regulation	Deregulation has been generally "disappointing". Refusal rates for short trips have risen, and passenger waiting times have changed little. Regulation is needed to achieve economies of scale, particularly in dispatching, ensure consumers have complete information on fares, and reduce congestion. Regulation is also needed to balance taxi and transit fares, so that one is not inefficiently overutilized at the expense of the other.	med
Opening Portland's Taxi Market	Kramer, John and Mellor, William		1996	Taxi regulation in Portland	Taxi regulations should be limited to those needed to protect the public's health and safety.	med
Taxitrafikens egenskaper och taxikundernas uppfattning fyra år efter avreglering	Laitila, Thomas, Marell, Agneta and Westin, Kerstin		1995	Taxi deregulation in Sweden	Fares and waiting times rose following deregulation. Supply fell, largely because of increased part-time working. Customer satisfaction increased.	med

Title	Author(s)	Publication or Conference (if any)	Year	Subject	Key points	Relevance
Reform of taxi transportation. For better service quality	Ministere des Transports du Quebec	www2.mtq.gouv.qc.ca/personnes/taxi_reforme_en.pdf	1999	Taxi regulation in Quebec	Recommendations include relaxing the rules for transferring licenses, issuing new permits (possibly setting the number as a ratio to population), compulsory driver training (including for existing drivers), and abolishing the 'first in, first out' rule at taxi stands, allowing passengers to choose any taxi	med
Supply and demand for London taxis	MVA		2000	Ensuring late-night taxi availability in London	Proportional fare increases late at night (rather than a flat surcharge) would encourage more drivers to work unsocial hours, and have a minimal impact on demand.	med
The leasing of taxi licenses – a discussion paper. Paper for Passenger Transport Board, South Australia.	Radbone, Ian	www.taxi-l.org/leas01.htm	1998	Leasing of licenses	High lease fees are likely to have increased fares and depressed driver incomes. Possible solutions include earmarking part of fare increases for the driver, abolishing leasing, banning shift leasing or reintroducing restrictions on who can lease licenses (e.g. owner-drivers only).	med
Deregulation of the Dutch taxi sector	Rouwendaal, Jan; Meurs, Henk and Jorrijsma, Peter	European Transport Conference, Loughborough, September 1998	1998	Taxi deregulation in the Netherlands	Modeling suggests that a moderate reduction in fares, followed by free entry to the market, is the best way to increase taxi use. Demand would increase by 20%, and response time by 23%.	med
Are taxi services ready to become a real part of the public transport chain?	Sayer, Anne	Local Transport Today, 26 October 2000	2000	Integration with broader transportation policy	Portsmouth, England, is developing a 'quality partnership' with taxi operators. Taxis will be allowed to use bus lanes, among other things, in return for a commitment to minimum service standards.	med

Title	Author(s)	Publication or Conference (if any)	Year	Subject	Key points	Relevance
Ridding the Big Apple of Bad Apples, New York City's 'Bad Driver' Program	Schaller, Bruce	International Conference on Taxi Regulation, Montreal	1992	Penalties for offending drivers	A scheme to target persistent offenders has improved quality of service in New York City.	med
Cab Availability and Ridership in New York City, 1990-99	Schaller, Bruce	www.schallerconsult.com	2000	Taxi availability in New York City	Increased fares (through reduced demand) and increased medallion numbers are the two main policy tools to increase taxi availability.	med
Unregulated taxicabs	Suzuki, Peter	Transportation Quarterly, 49(1): 129-138	1995	Unregulated (vernacular) taxicabs	Unregulated cabs, which are generally illegal but often ignored by the authorities, play an important role in many major cities. They serve neighborhoods that are ignored by the regulated industry on grounds of racial discrimination and/or personal security fears.	med
English experience of deregulation of the taxi industry	Toner, Jeremy	Transport Reviews, 16(1):79-94	1996	Taxi deregulation in England	Deregulation had little success. It resulted in higher fares, and poorer quality. A positive correlation was found between supply of taxis and fare levels.	med
An econometric approach to demand, supply and service quality in the taxi industry	Toner, Jeremy	University of Leeds Institute for Transport Studies, Working Paper 339	1991	Modeling of demand, supply, and service quality	Demand is inelastic with respect to passenger waiting time, but elastic with respect to price.	med
Discussion paper on taxicab leasing and related issues	Toronto By-law review sub-committee	www.taxi-l.org/leasing.htm	1996	Leasing of licenses	Leasing has increased license values, putting license ownership beyond the reach of most drivers. Since owner-driver taxis provide better service, it recommends creating a new category of owner-driver taxi licenses.	med

Title	Author(s)	Publication or Conference (if any)	Year	Subject	Key points	Relevance
German "smart bus" systems. Potential for application in Portland, Oregon	Behnke, Robert		1993	Integration with transit	Describes the Flexible Operations Command and Control System, and how it is being used in Germany to integrate conventional fixed-route transit with flexible-route bus, minibus and taxi services.	low
Taxicab transportation: international structures, trends and prospects to 1990	Britton, Francis	Transport policy and decision making, 3:341-356	1986	World survey of taxi numbers	The US has far fewer taxis per capita than other industrialized nations.	low
Serving the main cities of the world by taxi and by limousine	Commission des transport du Quebec		1996	Worldwide comparison of taxi numbers	Compilation of data on taxi numbers per capita in major cities worldwide.	low
Telematics for a fair ride	d'Hont, Susie	Traffic Technology International, Autumn 1995, 74-75	1995	Taxi management at airports.	An electronic identification system, allowing access to the airport for authorized taxis only, has been introduced at Stockholm Arlanda airport.	low
Modeling the demand for taxicab services	Harmed, Mohammed	Road and Transport Research 8(3):22-33	1999	Modeling demand for taxis	Identifies various factors which influence demand.	low
Mentioned in dispatches. Optimizing taxi fleet management	Holpfer, Günther	Traffic Technology International, Dec 1999/Jan 2000, 47-49	2000	Dispatch systems	Describes a GPS-based dispatch system, which claims to reduce passenger waiting times and improve service.	low
Technical efficiency and ownership: the case of booking centres in the Swedish taxi market	Månsson, Jonas		1996	Dispatch centers in Sweden	Abolition of central dispatch does not appear to have resulted in significant changes to efficiency.	low

Title	Author(s)	Publication or Conference (if any)	Year	Subject	Key points	Relevance
Unconventional and community transport in the United Kingdom	Nutley, Stephen		1990	Shared taxi schemes	Shared taxi schemes in Belfast, Northern Ireland, have been successful largely because of the disruption to transit services caused by civil unrest.	low
The New York City Taxicab Fact Book. 3 rd edition	Schaller, Bruce	www.schallerconsult.com/taxi/taxifb.htm	1994	Key statistics about the New York City taxi industry	Sets out data on passenger and driver numbers, fares, etc.	low
New taxi structure relieves congestion at Washington National Airport	Stehman, Ronald	Taxi and Livery Management, October 1991.	1991	Taxi management at airports.	A new holding structure has reduced congestion and pollution from taxis queuing at Washington National Airport.	low
The demand for taxis and the value of time - a welfare analysis	Toner, Jeremy	University of Leeds Institute for Transport Studies, Working Paper 333	1991	Value of taxi passengers' time	The value of taxi passengers' time can be used to model the optimum number of taxis and fare levels.	low
A network model of urban taxi services	Yang, Hai and Wong, S.C.	Transportation Law Journal, 32(4):235-246.	1998	Modeling of how taxis cruise the road network in search of customers	In theoretical terms, a central dispatch system would significantly reduce the number of taxis required to serve a certain number of passenger movements.	low
A macroscopic taxi model for passenger demand, taxi utilization and level of service	Yang, Hai et. al.	Transportation, 27:217-340	2000	Modeling taxi services.	Models passenger demand, taxi utilization and level of service, based on Hong Kong data.	low

ROLE OF TAXIS IN THE TRANSPORTATION SYSTEM

“Taxicabs are a vital public service,” argues Trudel (1995). They serve the elderly, low-income people and others who do not have access to a car. They are a back-up service for unplanned travel, such as emergencies, and for one-off trips to the airport, for example. They are also used by professionals and others with a high value of time, to attend meetings.

Taxis also bridge the gap between private cars and transit, particularly in low-density suburbs and districts that are poorly served by transit. They mitigate perceived parking shortages in close-in shopping, entertainment and restaurant districts. They also provide a solution to the problem of alcohol consumption and driving (Boroski and Mildner, 1998).

TAXI REGULATION AND DEREGULATION

Several authors advocating deregulation do so from a more general perspective that regulation and the role of government ought to be reduced to a minimum. The Buckeye Institute’s (1996) study of regulation in Ohio cities, for example, focuses on taxi regulations as a barrier to starting new businesses. Kramer and Mellor (1996), calling for the opening of Portland’s taxi market to any driver that has a license, a safe vehicle and adequate insurance, and passes a background check, argue that the role of the government should be limited to protecting the public’s health and safety. “Beyond that, regulations trench on the basic civil right to pursue a business or profession free of arbitrary and oppressive government regulation,” they say.

Insofar as a consensus exists within the literature, it is that regulation is only needed in cases of market failure. The question, then, is whether market failure occurs in the taxi industry. Several authors, such as Schaller and Gilbert (1996), argue that it does: consumers hailing a cab on the street cannot make a rational decision on fares and service quality, due to lack of information. Moreover, people take cabs because of their speed, and time spent ‘comparison shopping’ would undermine this.

Even deregulation advocates, such as Boroski and Mildner (1998), acknowledge that fare deregulation might create problems for people who hail cabs on the street. These passengers are unlikely to turn away the first cab, as they do not know when the next one will come along, or what price it will charge. Boroski and Mildner suggest that these people could telephone for a taxi or go to a taxi stand instead.

Gentzoglanis (1992) puts forward two more rationales for regulation: exploitation of economies of scale, particularly in the radio dispatch market, and ensuring the optimum use of transit. Since taxis and transit are close substitutes, if one is priced low, it will be overutilized and the other underutilized. If transit is overpriced (above short-run marginal cost), an efficient policy would be to reduce transit fares or increase taxi fares. If neither is

possible or politically feasible, then the alternative efficient policy would be to restrict the number of taxis.

Empirical evidence of the effects of deregulation

Most empirical studies have found that deregulation has increased the supply of taxis. However, this is often at the expense of higher fares, and increased refusal rates for passengers requesting short trips.

Teal (1992) calculates that taxi rates in deregulated cities were eight to ten percent higher than would have been the case if no deregulation had taken place. Fares fell in only one deregulated city, Sacramento. While large operators competed on price grounds in San Diego and Seattle, offering lower fares, this did not stimulate price reductions by competitors, nor did the low price companies experience major growth in market share, Teal reports. Regarding service quality, waiting times for passengers in San Diego fell from 10 to 8 minutes, but in other cities, they remained steady or rose. Gantzoglanis (1992) suggests this is because waiting time is a function of the size of a firm's fleet, not the total number of taxis.

The failure of deregulation was probably largely due to low entry costs into the market, Teal concludes. "Ignorance of true market conditions, and the belief that they will succeed where other have failed, continually bring new entrepreneurs into this market," he says.

A study by Price Waterhouse (1993), commissioned by the International Taxi Cab Foundation, analyzed taxicab deregulation and regulation in 29 US cities. The effects of deregulation "have ranged from benign to adverse, depending on local conditions and markets," it concludes, with smaller cities generally benefiting most. While the supply of taxis increased dramatically, the study found that there were increases in fares and only marginal improvements in availability. Service quality declined, with more trip refusals, lower vehicle quality, and aggressive solicitation because of over-supply. Consequently, most cities that had fully deregulated taxi service have since reverted to some form of control over market entry. "Market imperfections peculiar to the taxi industry, including unusual product supply (e.g. first in, first out queues at cabstands) and consumers' lack of knowledge of taxi price and quality, tend to negate the improvement in price and performance associated with deregulation in other industries," it concludes.

In Seattle, the advent of an open-entry system led to an "atomized industry structure," with 217 firms running taxi services. This made enforcement a "nightmare" and left insufficient profits for investment, according to Avants et.al, (1996). The over-supply of taxis also reduced the earning potential of individual drivers, who responded by increasing fares. New drivers were untrained and inexperienced which meant that the quality of service deteriorated. As a result demand fell (British Columbia taxi study panel, 1999).

Schaller and Gilbert (1996) use evidence from the airport trip market in New York City to argue that competition does not lead to better service. Here, medallion cabs face

competition from for-hire vehicles, but rather than improve their service, they have “let the airport business slip away”.

In Sweden, the evidence is more mixed. Here, deregulation was accompanied by an increase in passenger waiting times from under three to five minutes and an increase in fares. While the number of taxis increased, more drivers worked part-time, and supply actually fell. However, passenger satisfaction also increased (Laitila et.al, 1995).

On the side of deregulation advocates, the Buckeye Institute (1996) examines the cost of regulatory requirements. In Dayton, Ohio, it calculates that the requirement for a separate dispatch office for each firm and 24 hour service, together with licensing fees, increase the cost of starting a cab company by \$67,000.

Boroski and Mildner (1998) acknowledge that “previous attempts at deregulation have encouraged destructive competition”. To overcome this, they argue for a system of competition based on property rights, particularly through auctioning off “curb rights” at taxi stands to individual firms. This, they suggest, would address the lack of competition created by the ‘first in, first out’ rule, where passengers are required to take the first taxi in line.

Entry controls

One form of regulation is control of entry to the taxi market. This can have a number of aims (Trudel, 1998; Boroski and Mildner, 1998), including:

- limiting traffic congestion caused by taxis
- maintaining driver incomes and avoiding “ruinous competition”
- maintaining reasonable profits, to allow investment
- ensuring minimum standards for service quality, such as vehicle condition and driver training
- guaranteeing that all areas and potential customers are served, through cross-subsidization
- ensuring only ‘serious’ firms provide service

This can be achieved through a simple cap on license or medallion numbers, or, as in Toronto, setting them as a ratio to population, commuter numbers, air passengers and convention goers. Alternatively, firms can be required to prove the ‘public need’ for the new taxis before the license is granted, as in Toledo, Ohio. However, the Buckeye Institute (1996) argues that this provides the opportunity for existing cab companies to use their political power to limit competition, particularly in the face of “ambiguous” criteria on what constitutes need.

In Portland, Oregon, permit numbers are based on a biennial demand study. This takes account of population changes and projections, including numbers of elderly and disabled persons, public transport ridership, airport and convention activity, and current taxi utilization patterns. However, as Boroski and Mildner (1998) point out, the study does not consider changes in other demographic factors such as income and age, land use patterns, or changes to the transport system such as car ownership, the prices of alternative modes, and parking availability and charges. "Ultimately, this analysis only calibrates the current ratio of taxicabs to population to the historical ratio, which is presumed to be 'correct', thereby perpetuating the historic low level of taxicab service," Boroski and Mildner conclude. They also question whether a study that says that no additional demand exists can be correct, when new applicants and existing companies are seeking new licenses.

Franchising is the approach taken to regulate entry in Los Angeles. Gilbert (1992) argues that this is a powerful means of achieving self-enforcement, as firms are anxious not to lose their franchise. Los Angeles also has a system of service standards, requiring operators to answer their phones and respond to trip requests within specified time periods.

A subtler means of entry control is the imposition of minimum standards for service quality (Buckeye Institute, 1996). These can include:

- requirements for a minimum number of cabs per firm;
- requirements for 24/7 service;
- requirements for a separate dispatch office for each firm, preventing operators from relying on cellular phones; and
- limits on the maximum age of cabs.

Sometimes, minimum standards can be used as an explicit means of entry control. In Western Australia, a review of the taxi industry for the Department of Transport concluded that barriers to entry were required to ensure service quality, and maintain supply and driver income. However, it rejected restrictions on license numbers, since these were considered to increase fares and waiting times, and severely affect service levels at peak times, for short trips and in outlying areas. Consequently, more stringent driver training, in the form of a three-month course, was recommended instead (although not implemented), along the lines of the London model (BSD Consultants, 1999).

While many jurisdictions have sought to increase the numbers of licenses, several in Canada, notably Montreal, have implemented a buyback plan to reduce taxi numbers. The Montreal scheme aimed to improve efficiency and profitability without diminishing service quality, and was funded by license holders (Trudel, 1998).

Counter-intuitively, increased supply appears to lead to increased fares, as drivers seek to maintain their income while making fewer trips. As well as those mentioned above, Toner's (1996) study of deregulation in England found a positive correlation between fares and the supply of taxis. Schaller (1999), however, calculates the elasticity of service

availability with respect to supply at 1.14, using data from New York City. In other words, excess demand would largely soak up any increased supply. “Where the supply of cabs needs to be expanded, the number of cabs can be significantly increased without harming the revenue stream of existing operators” – alleviating a major industry objection to issuing more licenses, he concludes.

Entry controls can lead to high transfer values for licenses or medallions, through the artificial scarcity they create. This can result in higher fares, and/or reduced income for drivers. However, several authors, such as Trudel (1998), also suggest that the high value of licenses can encourage taxi firms to behave responsibly, out of a fear of them being withdrawn. Cairns and Liston-Heyes (1996) argue that medallions can be viewed as a type of bond paid for the assurance of good service; the prices paid for medallions are therefore “not necessarily evidence that regulation is inefficient.” However, as Gilbert (1992) points out, only two medallions have been revoked in New York City in 55 years, suggesting this threat gives minimal incentive against providing poor service.

Fare regulation

Fares are another key area in which taxis are regulated, either through prescribed fares, or fare ceilings as in San Diego, for example.

In its study of regulation in Ohio cities, the Buckeye Institute (1996) reports that average fares in Akron and Canton, where fares are unregulated, were 11.8% lower than in fare-regulated cities. The average fare in cities that used market pricing was \$2.59 for the first mile, \$2.85 in cities with a maximum fare ceiling, and \$3.10 for cities where fares were set by ordinance.

In New York City, Schaller (1998) reports that fare increases have not improved vehicle standards or driver incomes. If this is the aim of fare rises, they need to be accompanied by complementary regulations, for example setting maximum vehicle ages and capping lease fees, he says.

Schaller also points out that a key effect of fare raises is to reduce demand. In turn, this increases the availability of taxis. “It makes no sense to allocate taxi service through excessive waiting ‘costs’ [for passengers] because doing so degrades an essential attribute of the service – its convenience and speediness,” he says. “Much more sensible is to either allocate the service through higher fares or to satisfy higher demand by increasing the supply of service, e.g. issuing additional medallion licenses.” (Schaller, 2000).

IMPROVING SERVICE QUALITY

A number of papers highlight driver retention as a key to improving service quality. In New York City, Schaller and Gilbert (1995) note that experienced drivers are far less likely to attract summonses regarding reckless driving, refusals, discourteous and abusive behavior, or overcharging. The level of drivers’ commitment to the job is “critical to the

quality of service”, they argue. Therefore, the key to improving the quality of drivers is to increase the number of “proficient career drivers,” through better financial rewards and working conditions, and greater security from crime.

The leasing system is a prime culprit behind poor driver incomes, Schaller and Gilbert continue, as it shifts to drivers, rather than taxi firms, the financial risks of bad weather, traffic congestion and fluctuations in demand. It also means that drivers do not receive fringe benefits. “By creating a strong motivation for drivers to violate traffic laws, drive recklessly, refuse service and overcharge riders, low driver earnings and poor working conditions directly erode the quality of taxi service,” they conclude.

In Toronto, a review committee noted that “undisputed deputations” considered that independent owner-driver taxis provide a better quality of service (Toronto By-law Review Sub-Committee, 1996). It therefore called for the creation of a new category of owner-driver taxicab plates. These were subsequently implemented under the name of “Ambassador Taxis”.

Also in Toronto, a task force charged with devising ways to improve service recommended the creation of a “Taxicab Passenger Bill of Rights,” visibly posted in each taxicab. This would seek to “provide clear standards that should be met every time a customer enters a Toronto taxicab,” as a point of reference for both drivers and passengers.

Schaller (1992) describes New York City’s ‘Bad Driver’ program, adopted to improve service quality by combating persistent offenders. It focuses on repeated violations, and particularly those that affect passenger service such as rude or abusive treatment of passengers, reckless driving and tampering with taximeters. Suspensions and revocations are used for serious violations; for lesser infractions, drivers are required to attend a remedial course.

In Portsmouth, England, the city is developing a ‘quality partnership’ with taxi operators. This requires operators to commit to minimum service standards in return for permission to use bus lanes, among other things (Sayer, 2000).

Driver training is in many jurisdictions considered key to improving service quality. In Quebec, training covers experienced drivers as well as new applicants, with courses on public safety, transportation for the disabled and client service and knowledge of tourist attractions (Trudel, 1995). Vancouver’s TaxiHost program is another that is often cited in the literature. The British Columbia Taxi Study Panel (1999) recommended making this compulsory for all drivers.

However, Schaller and Gilbert (1996) argue that the capability of testing to distinguish good drivers “has not been demonstrated”. Driver quality is linked most strongly to experience and full-time commitment to the job, they point out. On the other hand, by restricting the number of drivers available for firms to employ, training programs might improve service quality through increasing driver incomes, they suggest.

ENSURING SERVICE TO ALL NEIGHBORHOODS AND AT ALL TIMES

This issue has received relatively little attention in the literature, possibly because, other than in cities such as New York, street hails are generally not as prevalent as in San Francisco. With telephone dispatch, universal coverage is perhaps easier to ensure.

In Toronto, the taxi task force recommended a \$2 evening surcharge from 9 PM to 6 AM, to encourage drivers to provide service during these hours (Toronto Task Force, 1998). In London, where a fixed surcharge already applies, a modeling study suggested that a percentage surcharge would lead to a better match between supply and demand during off-peak hours. This would be achieved largely by encouraging drivers to work during these hours, rather than by pricing off demand, the modeling showed (MVA, 2000). As of June 2001, London mayor, Ken Livingstone was seeking to implement these recommendations.

Suzuki (1995) notes that regulated taxi firms refuse to serve many urban neighborhoods that are perceived as dangerous or dominated by ethnic minorities. In many cities, service here is instead provided by unregulated or vernacular taxis, which often operate illegally but with the tacit consent of the authorities.

In Western Australia, area restricted taxi licenses have been introduced to address poor service in outer areas. Around 70 licenses have also been issued for Peak Period Only taxis (BSD Consultants, 1999).

In Sweden, several cities have experimented with flexible fares, to reflect demand at different times of day (Faber, 1998).

INTEGRATION WITH BROADER TRANSPORTATION SYSTEMS

Integration of taxis and other modes is another theme that is sparsely covered in the literature. Most examples are from outside the United States, although in Cedar Hill, Oregon, a Portland suburb, the mass transit authority has contracted with a taxi firm to transport residents to and from the light rail station. Regular Tri-Met transit authority fares apply, and the service is used for an average of 130 rides per day at an average cost of \$4. This will be the subject of a forthcoming Transportation Research Board paper.

In Antwerp and Ostend, the TOV Taxi scheme offers people with a special bus or tram ticket a sizeable reduction on their taxi fare on the return leg of their trip. For example, people going out in the evening can make the outward trip by public transport, and return by cab. The scheme is subsidized by the public transport company and the taxi industry (Faber, 1998).

In England, London Transport has piloted a scheme to provide taxis from outlying subway stations, under its Home Link scheme. The aim was to stimulate off-peak demand, through reducing concerns among passengers and potential passengers regarding personal security, travel time, baggage and cost uncertainty. Through focusing on people's total door-to-door travel needs, London Transport believed that public transport's market share could be expanded (Bailey, 1998). Usage, however, has been low (Sayer, 2000).

In Quebec, taxi firms have had some success in opening up new markets, since this was permitted by a change in the law in 1983 (Trudel, 1995). Examples of the new business opportunities pursued include replacing bus services, paratransit, school transportation, sightseeing, flat-rate rides such as to and from airports, patient transportation, parcel and grocery deliveries, and emergency services (e.g. battery boosts for winter drivers). In Saguenay-Lac-Saint-Jean, taxi firms offer a car return service for intoxicated drivers.

Shared taxis

Seattle and San Diego amended their ordinances to allow shared taxi rides as part of deregulation, in the expectation that such innovative services would spring up. In San Diego, the city also developed a zonal fare structure for shared rides. However, no services in fact materialized, probably because demand densities were too low (Teal, 1992).

One taxi company has initiated a ride sharing program in Quebec City (Trudel, 1995). In British Columbia, the taxi study panel recommended the development of shared ride services, to give the public access to lower-cost services and the industry new ways to improve profitability.

Experience with shared taxis primarily comes from Europe, however. Many German and Austrian cities use shared taxis to replace transit services in the evening and at night, and in sparsely populated areas. Often, these schemes have been initiated by the transit operator as a cost-cutting measure, and are subsidized by the operator (Peterson, 1995). In many cities, taxis can be reserved from on board streetcars and buses. In the Netherlands, the rail company subsidizes a shared taxi scheme to rail stations.

A shared taxi scheme from the rail station in Ipswich, England, was abandoned after it failed to attract any significant number of passengers. However, an evaluation (Transport and Road Research Laboratory, 1990) suggests that this was due to poor marketing and organization, rather than fundamental obstacles to taxi sharing. The main problems were found to be ignorance of the scheme's existence, the psychological barrier of asking the driver to arrange a shared ride, and the perceived low probability of finding other passengers with whom to share. The report calculates that depending on the fare structure, demand would in fact have been sufficient to operate the scheme. It recommends the use of fare zones to reduce the cost uncertainty for passengers, and clear labeling of destinations.