Spring 13

The Economics and Effects of The London Congestion Charge

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Aaron: this is a very good effort—grade: 95

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According to the London Department of Transport, 1.1 million people entered into central London during the morning peak hours of 7:00 am-10:00 am in 2001. Of those 1.1 million people, 150,000 (13.7%) used private transport. With that being said, average traffic speeds in central London have significantly decreased as well. David Begg of the Commission for Integrated Transports stated, "around 40% of the total national level of congestion occurs in the Greater London area." Average traffic speeds in central London have fallen over the last decade, with the average morning peak-period traffic speed for 2000-2003 just 9.9 mph, compared with a peak of 14.2 mph in 1974-1976. Transport for London suggests that, "there is now on average a three minute delay for every mile that a vehicle travels inside the charging zone." On February 17th. 2003, London began its initiative plan to tackle the global problem of urban congestion by introducing a congestion charge for central London. London's initial plan was to induce a 5 British pound daily charge for vehicles entering into the Inner Ring Road charging zone. London's hope was that the daily congestion charge would significantly reduce the level of congestion faced by individuals traveling into and out of central London by either private or public transportation. London was able to tackle the public externality of traffic

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congestion through a charge because they were able to successfully ensure that only those drivers with a valuation of their journey continued to travel and those with a low benefit from travel altered their behavior. In this paper, I will guide you through the effects an externality has on a society and how London's implementation of a congestion charge helped to reduce the externality of traffic congestion within its nation.

Before I begin speaking about London's application of a congestion charge, I must first lay the groundwork for what an externality is and how it was first applied in Economics. The concept of an externality appears to have originated from Alfred Marshall, a British economist in the 19th and 20th centuries. (Yandle 6) Alfred Marshall initiated the concept when he argued that increasing (decreasing) cost competitive industries are inefficient when the entry of new firms into an industry imposes external harm (benefits) on existing firms. (Marshall 1922) In short, the entry of new firms produces costs or benefits that are external to the firm but internal to the industry. In 1920, British economist Arthur C. Pigou developed Alfred Marshall's idea when he wrote *The Economics of Welfare*. In *The Economics of Welfare*, Pigou argued that firm owners pursue their own marginal private interest rather than a marginal social interest. Pigou stated that when marginal social interest deviates from the marginal private interest, firm owners have no incentive to internalize the cost of the marginal social cost. Furthermore, Pigou claims that if a

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firm produces a marginal social benefit, individuals receiving the benefit have no incentive to pay for that particular service. Pigou labels these specific instances where individuals have no incentive to pay as incidental uncharged disservices and incidental uncharged services.

Arthur Pigou asserts that a divergence between private and social net product cannot be corrected by just private contractual arrangements. With that being said, Pigou made it very clear when he expressed that government intervention was ultimately necessary to resolve any external effects. In Arthur Pigou's 1920 edition of *The Economics of Welfare*, he used an example of road congestion to further prove his point. Road congestion is an example where drivers impose external costs on other drivers by entering a congested road, thus creating an externality. Pigou demonstrated this externality by using an example of two roads, one shorter but with congestion and one longer without congestion. He suggested the two roads ABD and ACD where both would lead from point A and end at point D. Pigou stated,

> "If left to itself, traffic would be so distributed that the trouble involved in driving a representative cart along each of the two roads would be equal. But, in some circumstances it would be possible by shifting a few carts from route B to route C to greatly lessen the trouble of those still driving on B, while slightly increasing the trouble of driving along C" (Pigou 1920)

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Pigou finishes his two-road example with the assertion that under these particular circumstances a rightly chosen measure of differential taxes against road B would create an artificial situation that is superior to the natural one. He emphasized that only under a rightly chosen measure would the differentiation take place. Furthermore, Pigou asserted that the externality of road congestion could not be removed by just private contracting.

Pigou's view that the private market fails to achieve efficiency is shown in several other cases in *The Economics of Welfare*. In his 4th edition, Pigou mentioned numerous examples of both positive and negative external effects, each of which he proclaims call for government intervention. His examples of positive externalities include lighthouses that give light to boats in fog, constructing roads and tramways that increase the worth of adjacent property, planting forests that produce positive climate changes, lamps on doors of private houses that give light to dark streets, private pollution reduction expenditures, and scientific research (Pigou 183-185). Pigou's examples of negative externalities include surrounding forest harm caused by sparks from railway engines (134), game preserving activities by land owners that causes animals to invade neighboring property (p 186), factories built that destroy the amenities of adjacent property (p.186), operating cars in a way that wear out surface roads (p.186), competitive advertising (pp 196-200), bargaining over prices and wages (pp 201-203), and the work of women in factories in a way

that injures the health of their children (p.187) Pigou's viewpoint of market failure in a society can be seen everywhere. He strongly believed that government intervention within a market would allow transaction costs to be avoided. He also saw externality instances as something that could and should be intervened by the government to restrain individual action. His standpoint can be best seen when he stated, "Over and above these there are many obstacles that prevent a community's resources from being distributed among different uses or occupation in the most effective way. It may become feasible for governments to control the play of economic forces in such wise to promote economic welfare. (pp. 129-130) Arthur Pigou strongly believed that private arrangements were unable of resolving the problem of externalities. It is under Pigou's belief that externalities can only be solved with government intervention that the basis of the London congestion charge is constructed.

As said earlier, traffic congestion is a negative externality that is forced upon a society. The external cost of traffic leads to a market failure. When many cars enter a particular area, a negative externality is formed because an unbargained-for cost is imposed on society. Negative externalities are unintended costs that are imposed onto a third party as a result of the profit maximizing actions of one person. These unwanted costs are imposed onto a third party where the cost to society is greater

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than the cost the consumer is paying for it. In other words, the social marginal cost outweighs the social marginal benefits to society. Many times when a negative externality is present in an unregulated market, producers of the good fail to take responsibility for the external costs that are being passed onto society. In the presence of an externality, a market failure occurs because the generator of the externality does not have to pay for the harming of others. In the case of traffic congestion, the driver acts as if the cost to society is zero, when, in fact, social marginal costs to society are involved.

With that said, negative externalities also cause an overproduction of the good. This means that the social or total costs of production far exceed the private costs that are imposed onto third parties. The following supply and demand graph helps illustrate how a negative externality can cause there to be an overproduction within the market.

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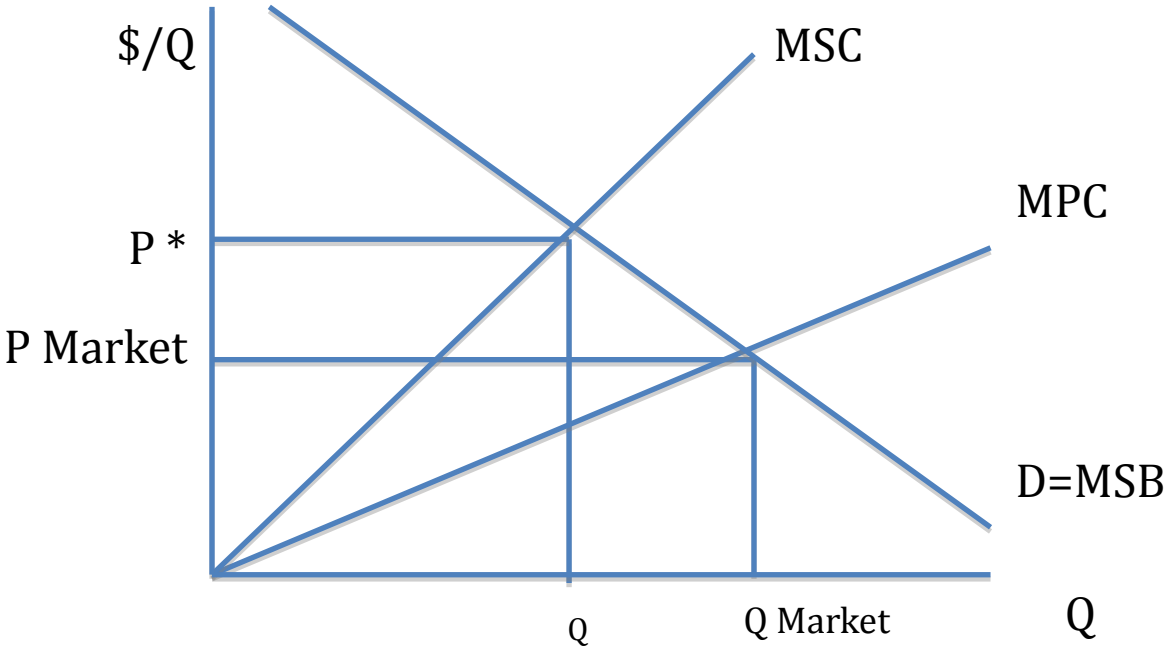

The market produces an outcome that is not efficient in relation to society. The supply curve only represents the private costs of production and fails to incorporate the social costs or costs on uninvolved individuals. The MSC curve represents all the costs involved in production, including private production costs and external costs. The efficient level of outcome occurs when the demand curve and the SC curve meet. Notice that Q market > Q*. This means the market has produced more than the efficient amount of the particular good. Also, note that P market < P*. This shows

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that the market price is less than the efficient price. The market outcome is inefficient because the private market leads suppliers to produce more of the good whose cost exceeds their value to the customer. The good with negative externalities is overproduced because the price of the good to the consumer does not cover all of the costs of producing or consuming the good. If the private marginal costs and the additional marginal costs involuntarily imposed on third parties were accounted for, the price of the good would be higher and people would consume less.

The case of the London road network where there is free access is a specific example of the overuse of a common resource. Each additional driver on the road slows down other drivers, of course unless the traffic is light. These additional drivers on the road do not perceive their presence as a cost since it is not included in his or her own journey costs. The following graph illustrates the total private costs to motor users when a certain number of trips per hour are made on a particular road. As additional motor users travel on that particular road, a drivers total private costs increase.

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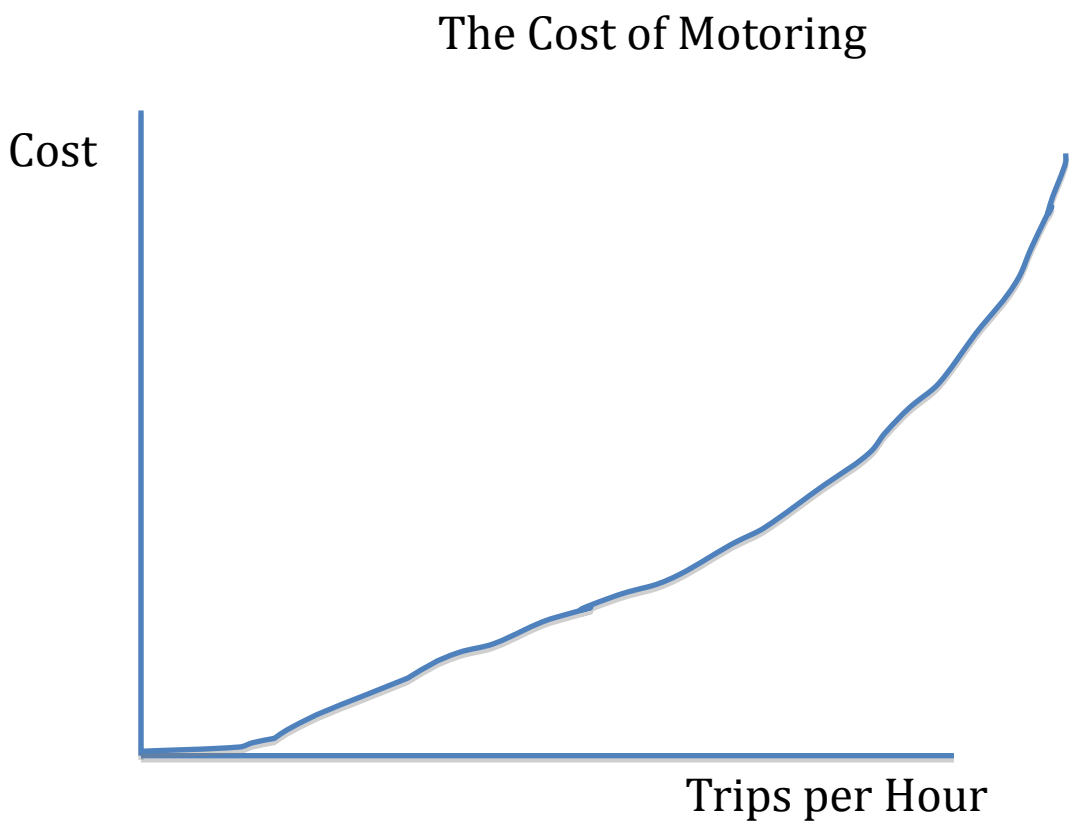

These private costs include gas costs, specific time costs, and any other costs that are involved with traveling. These total costs continue to rise as the number of trips increase because car speeds are decreased. Decreased car speeds leads to an

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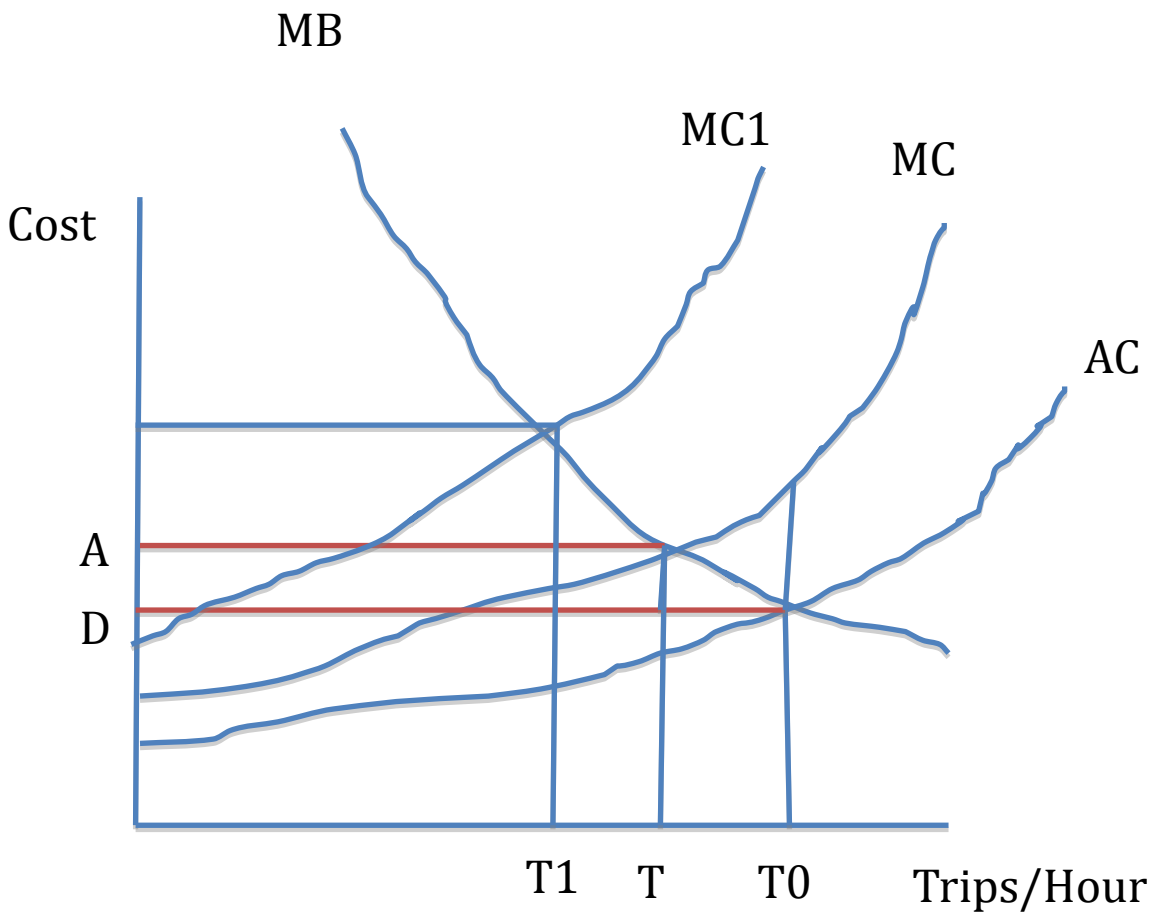
increase in costs per given trip. An increase in costs per given trip translates into the average and marginal trip costs shown in the following graph.



In the graph, we must first observe the average cost line and the marginal cost line. The average cost line in the graph is the total cost divided by the number of trips. The marginal cost line is the cost of making an additional trip on a roadway. Because

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total costs of making a trip increase faster than total trips itself, the average cost is always less than the marginal cost. Each additional trip that is made adds more to total costs than the previous trip taken.

The private cost to a motor user of making a trip on a particular road is the average cost. With that being said, if the private cost to the motor user is less than the private benefit that he or she will gain from making the trip, the motor user will go ahead and make the trip. The equilibrium number of trips happens at the point on the graph where average costs equal marginal benefits, represented by the point T0. The marginal benefit curve is represented by the demand curve where price increases as demand decreases. The social optimal number of trips would be where the marginal benefit curve meets the marginal cost curve. This would equate to a lower total number of trips, represented by the point T. Consequently, the equilibrium number of trips is lower than the social optimal number trips. This is because each individual road user fails to take into account that when they go on a trip they are slowing down other motor users. Also, by undertaking a trip they are adding to every motor user's time and gas costs. This is a prime example of a negative externality. At each point beyond T, the social costs of a trip surpass the benefits of a trip, and the deadweight loss is the sum of these differences between T and T0.

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In his declaration speech for election to the London Mayor in 2000, Ken Livingstone vowed to reduce traffic congestion in the city of London by 15% by the year 2010. Specifically, he promised to come up with the best possible congestion charge scheme that would discourage unnecessary car journeys in the central London zone. All revenue from the congestion charge would then be placed back into a plan to improving transport within the city. The Greater London Authority Act of 1999 stated that the elected mayor in 2000 would be required to produce and implement a Transport Strategy. The Greater London Authority Act stated that the mayor's Transport Strategy was to be "for the promotion and encouragement of safe, integrated, efficient and economic transport facilities and services to, from and within Greater London." (Greater London Authority Act 1999, sections 141 and 142) Newly elected mayor Ken Livingstone's Transport Strategy was published in July 2001 that included proposals for a congestion charge for central London. The congestion charge was allowed in February 2002 and implemented on February 17th, 2003.

The congestion charge that was implemented in February 17th, 2003 is a 5 British pound daily fee to drive into central London. The charging zone is limited by the Inner Ring Road and covers an area of 8 square miles. A motor user is given an

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area license when he or she is charged that allows them the right to drive into and out of the charging zone as many time as they like throughout the day. The applicable charge times begin at 7:00 am and end at 6:30 pm on weekdays. These charges are not valid on public holidays. The charging cost is the same for all entitled vehicles entering the zone from outside zones. Individuals that reside within the charging zone are offered a 90% discount on the daily charge. The congestion charge applies to all vehicles parked or driven on public roads within the charging zone. Resident vehicles that are parked off the street or in a resident's parking bay throughout the congestion charge applicable charge times for one day are not expected to pay the charge for that specific day. Vehicles entering the charging zone have their license plate read by cameras using automatic number plate recognition technology. The vehicle's registration information and plate number are then stored in a database that is compared each night against a database of those vehicles that have paid the congestion charge for that day. Those vehicles that are found to have not paid the congestion charge for that day are reported to the DVLA. The DVLA will then pass the information onto the Transport for London who will assess the vehicle owner a 80 British pound fine. The 80 British fine will be reduced to 40 for payment within two weeks, but increased to 120 if not payment is received after 28 days. Those vehicle owners that have not paid after 28 days and are persistent offenders will have their vehicles seized.

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According to the Transport for London, an estimated 150,000 drivers would be eligible to pay the congestion charge each day. The 150,000 drivers eligible to pay the congestion charge include heavy commercial vehicles, light goods vehicles, and private motorists. With that said, public transportation vehicles, motorcycles, and bicycles are exempt from the congestion charge. Registered disabled patrons will not have to pay the charge, as well as emergency vehicles, broken down vehicles, vehicles using alternative fuels, certain NHS staff vehicles, and firefighters for operational reasons. Payment for the congestion charge can be made either in advance or on the day of the journey. Payments must be received by midnight and any payment made after 10:00 pm is subject to a 10 British pound charge. Payment for the congestion charge can be made over the telephone, over the Internet, at specific retail stores, by post, or by text message.

Before the election of mayor Ken Livingston in 2000, The Review of Charging Option for London reviewed several ways in which a congestion charge scheme could be applied in London. The first congestion charge option that the Review of Charging Option for London suggested was a paper-based system. The paper-based system was ruled to be too burdensome to implement and enforce. The paper-based system would work using automatic number plate recognition that would

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automatically deduct a charge from a prepaid unit within the vehicle entering into the charging zone. This type of paper-based system could be applied to Central London within Ken Livingstone's first term as mayor ROCOL noted. They also noted that this type of system would have low administration costs and would be less inconvenient than the system where drivers have to purchase area licenses regularly. Another congestion charging option the ROCOL looked at was a workplace-parking levy of 3,000 British pounds per year. The workplace-parking levy would be an annual charge for provided spaces to businesses within the charging zone. These businesses would then pass these paid parking spaces onto its employees to park within the charging zone. The annual 3,000 British pound charge was figured based on off-street parking charges in central London. These off-street parking charges ranged from 12-15 British pounds per day. The workplace-parking level scheme was rejected on the basis that the scheme did not reduce congestion within the zone and because it did not discourage motor users from driving through central London without stopping.

Only an optimal congestion charge would equate social costs and benefits and internalize the negative externality of traffic congestion caused by motor users slowing down other motor users. This is the feat that Ken Livingstone set out to accomplish when he took post as London mayor in 2000. In order to fully

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understand the implications of Ken Livingstone's implementation of a congestion charge in Central London, we must first take a look at Arthur C. Pigou's Pigovian tax. Pigou suggested placing a tax on the offending producer of an overproduced good. Traffic being an overproduced good in London; it seems only evident to take a look at Pigou's Pigovian tax. In 1938, Pigou introduced the idea of placing a tax on overproducers by equaling the tax to the marginal damage on the externality causing good. He argued that an externality cannot be mitigated by contractual negotiation between the affected parties and that government should intervene to equalize the marginal private cost and marginal social cost. In short, Pigou stated that direct coercion by the government or careful use of taxes should be used against the party. The basis for a Pigovian tax is the idea that individuals should be confronted with the full costs of their actions. This means not just taking into account their own private costs, but also social costs.

The fundamental principle behind Pigou's Pigovian taxes is that the tax eliminates the divergence between the Marginal Private Cost and the Marginal Social Cost. The graph below illustrates a Pigovian tax and the effects it has on a negative externality producing party. Q1 represents the market equilibrium and Q* represents the optimal level of output.

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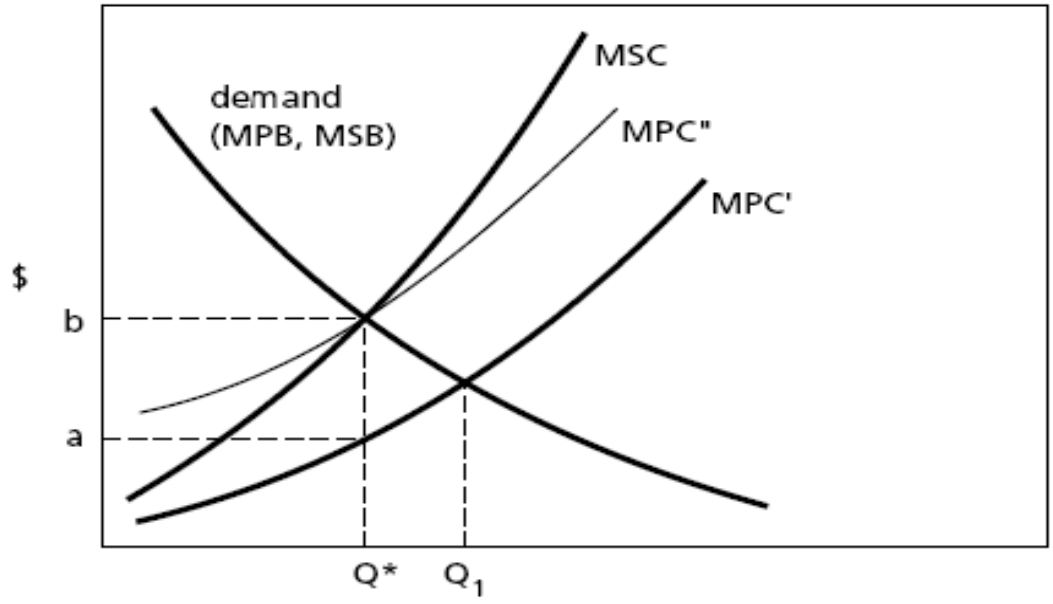

A Pigovian Tax equal to the intersection between the MPC curve and the MSC curve would raise the social private costs. The Pigovian tax would also shift the MPC curve by an amount equal to the distance from a to b. Consequently, the market would arrive at an optimal allocation represented by point Q*. Individuals that are faced with this cost increase by the tax now have an incentive to reduce their overall output by reducing the marginal externality. This type of market movement to optimal equilibrium is what Pigou called internalizing an externality. Pigou also argued that the tax should be assigned on the externality itself rather than on the output.

Understanding the effects of a Pigovian tax is beneficial in understanding Ken Livingstone's implementation of a congestion charge in the central London zone.

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Ken Livingstone saw London's negative externality of traffic congestion as something that could be internalized by imposing some sort of tax on vehicles entering into central London. He implemented a daily 5 British pound tax on cars entering into central London and by doing so made motor users value their trip into the charging zone. The tax raised vehicle users social private costs of driving within the area to a point where some individuals didn't see the benefit of driving in the charging zone. Drivers with a valuation of their journey continued to travel and those drivers with a low benefit from travel altered their behavior. Consequently, mayor Ken Livingstone was able to reduce traffic congestion in the area solely by incentivizing travel outside of the charging zone and by confronting vehicle users with the full costs of their actions.

The impact of the London congestion charge within central London was tremendous. Actually, within the first two days of the implementation of the congestion charge there was an exponential reduction in inner city traffic. On the first day of executing the congestion charge, 190,000 vehicles entered into and within the zone during charging hours. This is a decrease of around 25% from normal traffic levels before Ken Livingstone's application of the congestion charge. Omitting exempt vehicles from this statistic, the decrease in normal traffic levels would be around 30%. Anecdotal evidence suggests that journey times within

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central London were decreased by as much as half. According to the Congestion Charge of London, 100,000 motorists paid the charge. The Congestion Charge of London also reported that of the 100,000 paid motorists, 15-20,000 were fleet vehicles paying under fleet agreements. About 10,000 motorists failed to pay.

Over the first month of implementing the congestion charge, London saw a decrease in traffic within the inner city by 15%. On October 23rd, 2003, the Transport for London published a report examining the first six months of the congestion charge. The Transport for London found in their report that on average the number of cars entering central London was 60,000 fewer than the previous year. This statistic represented a significant drop of 30% on non-exempt vehicles entering into the charging zone. Around 50-60% of this reduction was found in the transfer of transportation to public transport. Approximately 20-30% of individuals moved their journey path to outside of the charging zone. The remainder of individuals switched to car sharing and increased the use of motorcycles and bicycles. The Transport for London also found in their report that journey times were reduced by 15%. The report stated that there were about 100,000 fines for drivers not paying the charge each month. Of these 100,000, about 2,000 drivers appealed against the fine. With that being said, the larger than anticipated reduction in traffic congestion meant that the revenues for the Transport for London would be

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only 68 million British pounds. This number is well below the projected revenue of 200 million British pounds per year that the Transport for London projected in 2001. Once the extensive roadworks were completed in 2001-2002, traffic levels had been reduced drastically and the profit projection was then lowered to around 130 million British pounds. A further report in October 2004 by the Transport for London stated that only seven of the 13 government aims for London transport would be met by 2010. That said, in the latest report by the Transport for London congestion was down by a total of 26% in comparison with the pre charge period. The latest report also concluded that traffic delays had been reduced. Looking through the many reports that the Transport for London has conducted, one thing is consistently concluded, traffic congestion has been exponentially reduced since the implementation of the London congestion charge.

Next, lets take an in depth look into the impact the London congestion charge had on local shops and businesses. The London Chamber of Commerce reported that shops and local businesses within the central London area have been drastically impacted by the implementation of the London Congestion charge. The impacts are both in terms of lost sales and increased delivery costs. The John Lewis Partnership, an employee owned partnership that operates John Lewis department stores, concluded in August 2003 that within the first 6 months of the operation of the

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congestion charge, overall sales at their Oxford Street store had fallen by 7.3%. The John Lewis Partnership also observed their stores outside of the Greater London area and found that sales had in fact increased by 1.7%. Unlike the John Lewis Partnership, London First's own report stated that businesses were broadly supportive of the congestion charge. Additionally, a London First report stated that employment was directly affected by the congestion charge. The report stated that there had been a reduction in some employment within the congestion-charging zone. The Transport for London widely criticized these reports by London First as unrepresentative of the Greater London area as a whole and stated that its own statistics reported that there was no direct effect on business within the area.

An initial report in May 2005 stated that the number of shoppers had declined by 7% in March, in April by 8%, and by 11% in the first two weeks of May. Many critics of the congestion charge saw these statistics as a direct effect of the charge, but the Transport of London exclaimed that the cause was an economic downturn as a whole. Around 2005, the London Chamber of Commerce indicated that 25% of businesses within the Greater London area were planning on relocating following the congestion charge implementation. Subsequently, an independent report 6 months after the congestion charge was introduced and stated that businesses within the area were in fact supporting the charge. London First

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supplemented the independent report with its own report that said 49% of businesses felt the scheme was working and only 16% said that the charge was not working. Finally, the Fourth Annual Review of the charge by the Transport of London indicated that activity within the charge zone had increased in terms of productivity and profitability. Ken Livingstone's first objective was to reduce overall congestion within the Central London area. With that said, businesses will learn to adapt to the charge and I believe in the long run will not be effected by the charge.

There was an obvious problem of traffic congestion within the Greater London area. Traffic speeds throughout the city were drastically decreasing and delays were exponentially increasing in the city. City residents were becoming consistently frustrated about the amount of traffic and the city needed to do something or take some sort of action. When Ken Livingstone was elected as mayor in 2000 he promised the city of London that he would implement a plan of action that would reduce traffic by 15% by the year 2010. Moreover, The Greater London Authority Act of 1999 stated that the elected mayor in 2000 would be required to produce and implement a Transport Strategy. Ken Livingstone was committed to accomplishing his promise to the city and devised a plan to implement a daily congestion charge of 5 British pounds to enter into the Central London area. Using the same principles as A.C. Pigou's Pigovian tax, Ken Livingstone was able to

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successfully internalize the externality of traffic congestion by placing a tax, in this case a congestion charge, on those vehicles entering into the Greater London area. By doing so, Ken Livingstone was able to force drivers to place a value on their journey. He was also able to increase driver's social costs to the point where some individuals chose not to travel within the area. Ultimately, Ken Livingstone accomplished his goal of reducing traffic congestion in the Greater London area. The London congestion charge is a prime example of how economics and domestic policy can work together to produce an efficient market outcome.

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