PUBP 620/LAW 328 - Regulation of Markets
College of William and Mary February 27, 2013
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Midterm Exam - Solutions

You have until 4:50pm to complete the exam, be certain to use your time wisely. Answer all questions directly on the exam (if choosing to use a laptop to type answers, please indicate that on the exam). Answer all questions completely but concisely. Including additional incorrect information in an otherwise correct answer may result in the loss of points. Remember to put your ID number on the exam. Good luck!

ID Number:

1. (20 points) Consider the readings from the beginning of the semester on the Iranian kidney market and the theoretical international trade of pollution. These two readings relate to two markets that are essentially absent in the United States:

   - A market for people in need of an organ transplant to purchase that organ directly from an organ donor.
   - A market for Americans to sell pollution and environmental waste to least developed countries (LDCs) willing to take that environmental waste in exchange for monetary compensation.

   The first market does not exist due to legal restrictions. The second is largely non-existent because of both technical feasibility of transporting pollution and because of environmental regulations. Choose *one* of these two markets and discuss all of the following:

   (a) Why the existence of the market could improve efficiency.

   For all four parts of this question, there are multiple ways to correctly answer the question. These solutions discuss the general principles that should be addressed by your answer. Refer to the comments on your exam for feedback specific to your particular answers.

   The key thing to identify for improvements in efficiency are transactions in which the marginal benefit to the buyer exceeds the marginal cost of the seller. If the existence of the market will allow these transactions to take place, it will increase total surplus leading to a more efficient outcome. Your answer should offer a compelling explanation of either a situation where the marginal benefit of receiving a kidney would exceed a healthy individual's marginal cost of giving up a kidney or a situation where the marginal cost of an LDC dealing with additional pollution is smaller than the marginal benefit to a developed nation of getting rid of that pollution.

   (b) Why the existence of the market could actually lead to more inefficient outcomes.

   This is a more difficult question. Your answer should highlight how the market may lead to transactions for which the true marginal cost to the seller exceeds the marginal benefit to the consumer. This typically should not be the case: if

marginal cost to the seller exceed the marginal benefits to the consumer, there would be no price to which both could agree. However, there are situations in which this can occur, typically cases where there is incomplete information on the part of one of the agents or misperceived risk. If a potential kidney seller underestimates the health risks associated with giving up a kidney, they may agree to a price that is actually below the true marginal cost of giving up the kidney. A similar situation could occur in the case of an LDC underestimating the health effects of pollution. The key to a correct answer is identifying these situations where either the marginal cost is underestimated or the marginal benefit is overestimated leading to transactions that actually lower total surplus. If discussing the market for pollution, negative externalities for neighboring countries (or any person not directly benefiting from the transaction) could also be a source of inefficiency.

(c) Why the existence of the market could lead to less equitable outcomes.

A very wide range of answers are possible when discussing whether the outcomes would be more or less equitable. The key in this case is to focus on how surplus is being distributed and to make a case for whether the distribution with the market is fairer than the distribution without the market. Your definition of what is more fair is not important for receiving full credit. What is important is that you relate the differences in the distribution of surplus with and without the market to that definition.

(d) Why the existence of the market could lead to more equitable outcomes.

See the comment for part (c).

2. (20 points) In class we briefly discussed the notion that forcing cable companies to pay a franchise fee, a lump sum the firm is required to pay to the local government, will cause a loss in efficiency. Use a graph with price on the vertical axis and number of cable customers on the horizontal axis to show the *additional* deadweight loss generated by the imposition of a franchise fee. Assume the following:

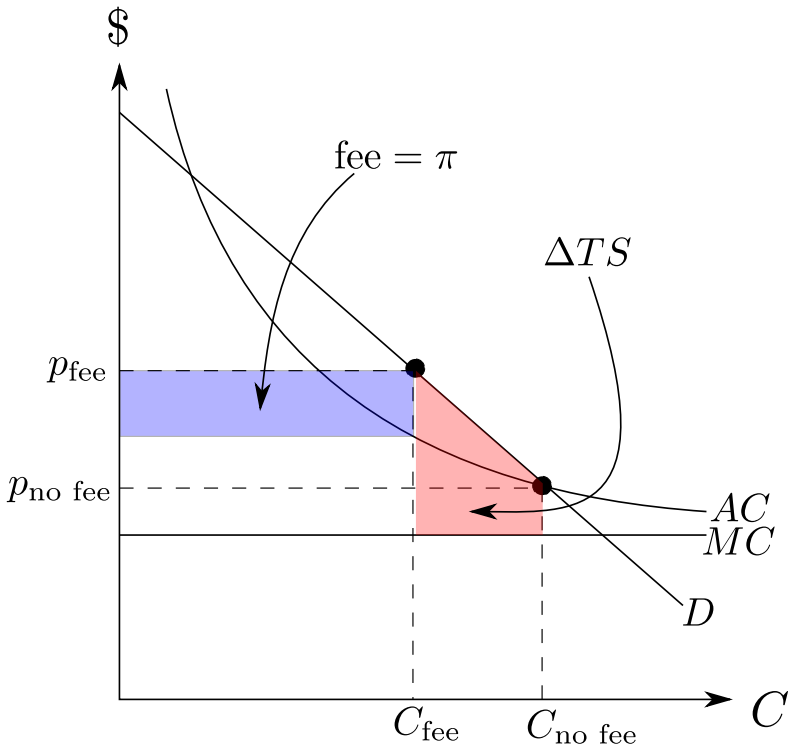
   - Demand for cable is decreasing as price increases.
   - The cable company has constant marginal costs and decreasing average costs.
   - There are quantities at which the cable company would be profitable.
   - To win the cable franchise, firms bid on the price they are willing to charge. Assume that this bidding is competitive and leads to the winning firm charging a price that just allows the firm to break even. Firms will also bid each other down to zero overall profits when the franchise fee is introduced.

   Be certain to clearly label all relevant curves, prices, quantities and areas on your graph. Include a brief written explanation of what your graph is showing (this explanation should require no more than two or three sentences).

   Your graph should have a downward sloping demand curve. The average cost curve should be downward sloping and should be below the demand curve for at least a range of customers given that there are quantities at which the company would be profitable. The marginal cost curve should be a horizontal line and should be below the average cost curve given that average costs are falling.

   The competitive bidding would drive the price down to where the average cost curve intersects the demand curve as this is point where the firm would break even. However, with the franchise fee, the firm will only break even if it earns profits on the cable sales equal to the total amount they must pay as a franchise fee. The price at which this occurs will be higher than the break even price. No firm would bid below this price because, after paying the franchise fee, they would end up earning negative profits. This increase in price will lead to a reduction in the number of customers served generating an additional deadweight loss equal to the total surplus from those customers (the area between the demand curve and the marginal cost curve over that range of customers).

   The graph below depicts all of the relevant curves and points. The crucial points are the price and number of customers without the fee, $p_{\text{no fee}}$ and $C_{\text{no fee}}$ on the graph, corresponding to the intersection of the average cost curve and the demand curve and the price and number of customers with the fee, p_{fee} and C_{fee} on the graph, corresponding to a point up and to the left along the demand curve. The profits at this point, the rectangular area shown in blue with a height equal to $p_{\text{fee}} - AC(C_{\text{fee}})$ and width equal to C_{fee}, should be equal to the size of the fee. The additional deadweight loss generated by the fee should be shown as the area between the demand curve and the marginal cost curve from C_{fee} to $C_{\text{no fee}}$. This is the red area on the graph.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3. (20 points) The proposed $11 billion merger between American Airlines and U.S. Air would make the merged airline the largest domestic carrier. The Department of Justice has yet to approve the merger and is still in the process of evaluating the potential anti-competitive effects of the merger.

   (a) Explain why the Department of Justice would be concerned that the merger will reduce efficiency in the market for air travel. While your answer should include the general economic critiques of horizontal mergers, it should also be tailored to the specifics of the market for air travel.

   The basic concern of the DOJ would be the possibility that the merged airline would use its increased market power to increase prices leading to fewer customers served and lower overall total surplus. This could result from the merged airline being the only airline operating on certain routes allowing it to operate as a monopolist (a particular concern for less popular routes that may have too little demand to support multiple airlines), the airline using its increased size to engage in predatory pricing to drive out other airlines, or through the reduced numbers of competing firms making it easier for firms to effectively collude to keep prices high (a concern given that there are only a handful of airlines). Any of these possibilities could lead to the merged firm ultimately being able to charge higher ticket prices, increasing profits but reducing the number of customers served and therefore generating deadweight loss. However, it could also lead to the firm engaging in other behaviors that would have a similar effect: increasing other aspects of price including baggage fees, ticket change fees and so on or lowering the quality of flight service through fewer amenities, reduced customer support staffing, smaller seats and so on. These are all dimensions of air travel that airlines compete on. Reducing the number of competitors could lead to underprovision of air travel along any one of these dimensions.

   (b) What arguments would American and U.S. Air likely make to justify the merger on efficiency grounds? Once again, be certain that at least part of your answer is specifically related to the air travel industry.

   The firms would likely argue that the merger would lead to lower average costs through the consolidation of several aspects of their operations. By combining their customer service centers, aspects of plane maintenance, hangar space and so on the firms could serve any given number of travelers at a lower average cost. The basic idea is that many of the costs of the firms that are not related to the marginal costs of flying a route (fuel, flight crew, etc.) would not double when doubling the size of the firm. The lower costs per customer mean that there is greater total surplus on each customer leading to greater efficiency.

   (c) If you were representing American and U.S. Air, how would you define the relevant market when determining whether the merged firm would lead to excessive market concentration? Be as specific as possible.

   With the goal of having the merger go through, the idea would be to define the market as broadly as possible. This would make the market concentration of the industry and the market power of the merged firm look less troubling. The

way to define the market broadly is to include any reasonably close substitute. So you would define the market to include all forms of long distance consumer transportation: buses, trains, all forms of air travel, ships and so on.

(d) If you were representing the Department of Justice with the goal of blocking the merger, how would you define the relevant market? Be as specific as possible.

Here the goal would be the opposite. You would define the market as narrowly as possible to make the merged firm look like it would have substantial market power. A realistic way to define the market that achieves this goal would be to say the market consists of domestic airlines that serve all major airports in the United States. This would eliminate many of the international airlines and budget airlines that have more limited US routes, leaving only a handful of airlines and a highly concentrated market.

4. (20 points) Consider the collusion that occurred between Sotheby's and Christie's auction houses.

   (a) How did the collusion between the auction houses affect efficiency in the auction market? How did it affect equity in the auction market? While your answer should relate to the specifics of how collusion took place, your discussion of the effects can be focused on the theoretical effects of that collusion.

   The basic effect of the collusion was to maintain higher fees on auctioned items, leading to a larger difference between what buyers paid and what the sellers actually received with that difference going to the auction houses. On all of the items still auctioned, this should not have actually affected efficiency. It should still be the buyer who values the item the most that submits the highest bid leading to the same overall increase in total surplus from the auction taking place (this increase is simply the difference between the marginal cost of giving up the item to the seller and the buyer's marginal benefit of receiving the item). What does change is the distribution of that surplus. The collusion is transferring more of that surplus to the auction houses, potentially reducing the surplus of both the buyer and the seller. In practice, this transfer is mostly coming from the seller as the buyer's highest bid inclusive of any fees he must pay will still be his marginal benefit from the auctioned good. Increasing the fees simply leads the bidders to lower what they are willing to pay the seller.

   There is a different set of auction items to consider, those items where the marginal benefit to the buyer is quite close to the marginal cost of giving the item up for the seller. When auction fees are increased, there may no longer be a price at which the seller is still willing to sell. These items would have been auctioned off in the absence of collusion and are no longer auctioned off with the collusion. This leads to an inefficient outcome as there is a net loss to society equal to the difference between the marginal cost and marginal benefit on the items. This loss comes out of the seller's producer surplus on the auction, the buyer's consumer surplus on the auction and the auction house's surplus from the fees.

   So overall, there is some deadweight loss generated but only on those items that do not get auctioned off as a result of the higher fees. In terms of equity, sellers are clearly hurt, both from not auctioning off items that would have provided them with producer surplus in the absence of collusion and because the higher fees are primarily coming out of the seller's surplus. The auction houses benefited from these higher fees despite losing out on fees on the items no longer auctioned off. The buyers were not particularly harmed on the items that were still auctioned off but did lose consumer surplus on items that were no longer auctioned off. So collusion benefited the auction houses largely at the expense of the sellers and, to a lesser extent, at the expense of buyers of the marginal item.

   (b) What aspects of the auction market made collusion more likely to work than in other markets? What features of the collusive agreement made it more likely for the agreement to hold?

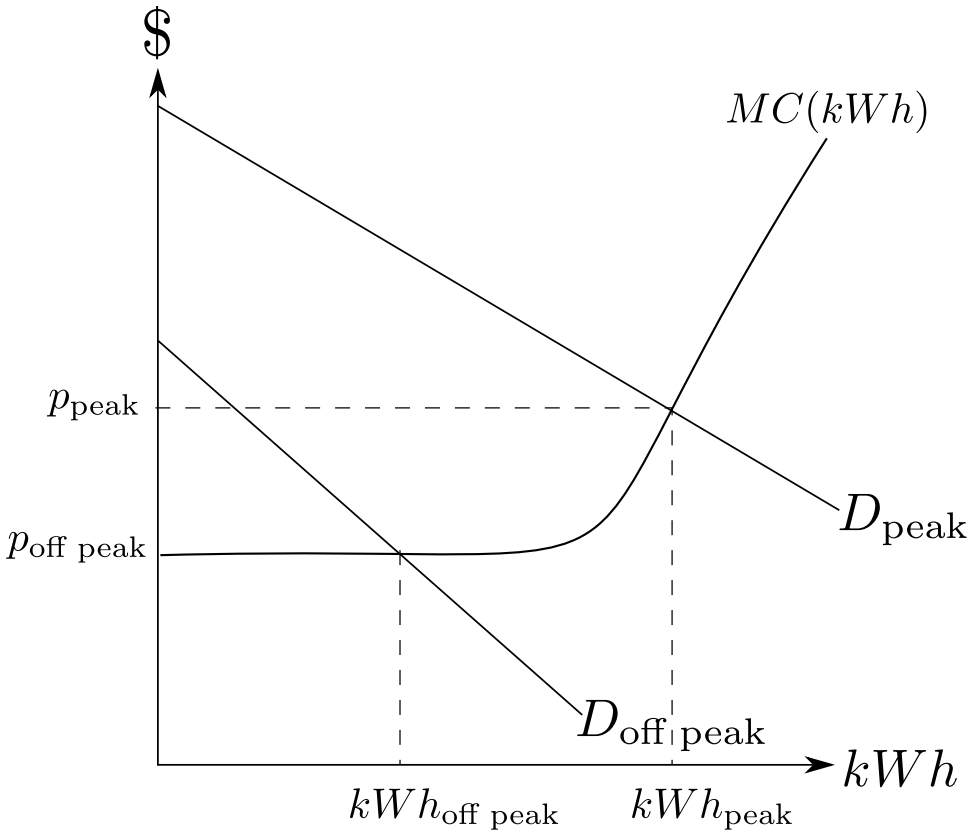
Several features of the auction market made collusion more likely. The industry is highly concentrated with Sotheby's and Christie's accounting for the vast majority of auctions. Therefore they only need to maintain an agreement between the two of them. More firms would make it harder to monitor compliance with the collusive agreement and make it more likely that someone would cheat. A second important feature is that the dimension the firms could collude on, the published commission schedule, is highly visible and easy to fix. Finally, the large monetary value of the high end auction items makes the collusion potentially worthwhile to the firms.

In terms of keeping the collusive agreement together, the main feature that helped was relying on published commission schedules. By specifiying the commission schedules in print and explicitly stating when they would be published, the firms could easily monitor each other and make certain that the collusive agreement was being upheld. It was also important that the firms agreed to eliminate the use of other pricing tools that could be used to undermine the agreement including loans to the sellers and the promise of charitable donations.

(c) Suppose that there will be a change in estate tax laws that will make it more favorable to make intergenerational transfers of cash rather than physical assets such as artwork or antiques. The expectation is that this law will go into effect in the next year and be permanent. Discuss how this will influence the likelihood of a collusive agreement between auction houses forming and being maintained.

The main effect of this change in estate tax laws will be to increase the potential profits from auctions in the near future and decrease the potential profits from all auctions after the law goes into effect. This still creates an incentive to collude. If collusion can increase the total profits of the industry, then collusion could lead to even bigger profits in the short run now that there will be more auctions in the short run. However, it will also make it far more likely that one of the firms will cheat to gain all of the (slightly smaller due to cheating) profits rather than splitting the collusive profits. The reason for this is that the potential gain from cheating, far larger profits today, will likely outweight the potential losses from cheating, the loss of the future stream of collusive profits, given that the law will increase today's profits and decrease future potential profits.

5. (20 points) The graph below shows the marginal cost of producing electricity, $MC(kWh)$, the demand for electricity during peak hours, D_{peak}, and the demand for electricity during off peak hours, $D_{\text{off peak}}$. The horizontal axis is measured in kilowatt-hours of electricity and the vertical axis is measured in dollars.



Currently, a regulator mandates that the electric company set price equal to marginal cost in both the peak and off peak markets, leading to the current peak and off peak prices of p_{peak} and $p_{\text{off peak}}$ shown on the graph as well as the corresponding quantities kWh_{peak} and $kWh_{\text{off peak}}$.

(a) Suppose that the regulator is considering using smart meters and an informational campaign to convince several peak users to switch to consuming electricity during off peak hours. If these customers switched, the marginal benefit they would receive from each kilowatt-hour of electricity would remain the same. Explain what effects this would have on total surplus, consumer surplus and producer surplus.

Consider convincing the marginal peak customer to switch (meaning the last customer who's marginal benefit was just equal to the peak price). When this one customer is switched from peak hours to off peak hours, the decrease in

peak demand will be small enough that there will be only a minimal decrease in the peak price while the increase in off peak demand will be small enough to keep the intersection of the off peak demand curve and the marginal cost curve along the horizontal portion of the marginal cost curve.

So for the remaining peak customers, the price will be reduced slightly leading to an increase in consumer suprlus that is a direct transfer from producer surplus. The electricity provider does not lose any producer surplus at peak hours on to the switched customer because price just covered marginal cost on that customer. In the off peak market, the price stays the same so there is no change in the consumer surplus or producer surplus for the existing customers. The transferred customer is now buying electricity at a lower price but has the same marginal benefit as before, so he now receives positive consumer surplus (before he had no net surplus since the price equalled his marginal benefit). The electricity provider does not lose any surplus on this customer as it is receiving a price exactly equal to its marginal costs for that customer.

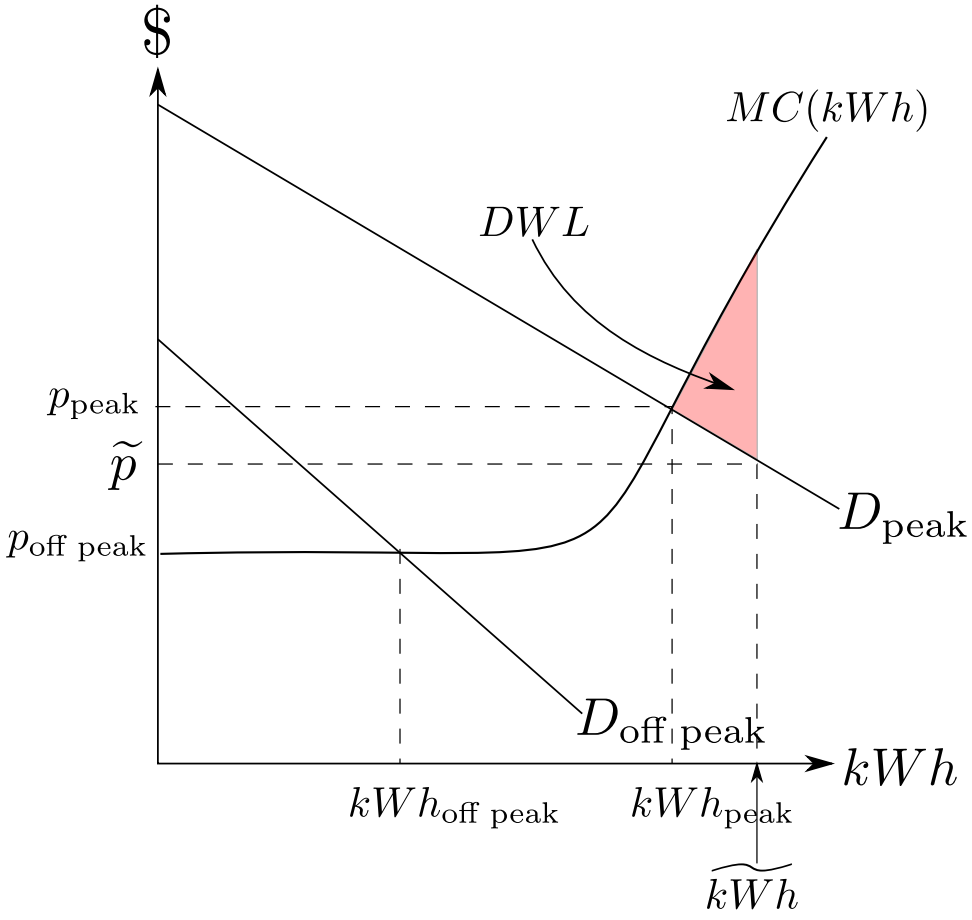
So overall, there has been a transfer of producer surplus to consumer surplus in the peak market and an increase in consumer surplus for the customer who switched, leading to an overall increase in total surplus.

(b) Given your answer to part (a), should the regulator pursue this plan? What other factors should the regulator take into account when evaluating whether to pursue the plan?

As argued above, there is an increase in total surplus resulting from the plan. However, this is not sufficient to make the plan worthwhile. It is also important to consider the costs of implementing the plan and determine whether or not they exceed the benefits. This would include the costs of distributing the smart meters and the costs associated with developing the information campaign. The benefits would be the increase in total surplus from the customers switching. However, these benefits would need to be weighted by the probability that the program actually convinces the customers to switch. The regulator would also want to consider any expected changes in electricity demand or generating capacity in the future as these would affect the predicted benefits of the smart meters.

(c) Recall the retail rate caps that were a feature of the California electricity regulation reforms. Suppose that this cap was in between p_{peak} and $p_{\text{off peak}}$ on the graph above. On the graph above, show how the imposition of these price caps would affect total surplus. You can assume that in cases where the price caps are not binding, the competition between electricity providers drives price down to marginal cost. Also assume that the utility distribution companies (UDCs) were required to meet all electricity demand.

There will be no effect on the off peak market given that the competitive price is already below the retail rate cap. The price cap would be binding for the peak market. This would increase the peak demand for electricity to the point $\widetilde{kWh}$ on the graph below (the price cap is labeled as $\widetilde{p}$). On all of the units between kWh_{peak} and $\widetilde{kWh}$, marginal costs exceed the marginal benefits to consumers leading to deadweight loss as shown on the graph.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