[Expiration of patent: def\_class121, def\_class121b]

A supply chain consists of one drug manufacturer M1, two retailers R1 and R2 and one market B1. M1 currently owns the patent of a drug.

* The drug manufacturer faces the production cost:
* and the (per-unit) transaction costs:
* For each unit of product purchased from the manufacturer, the retailers face handling costs of
* Transaction costs (per unit) are incurred between the retailers and the market:

The total cost perceived by the consumers in market consists of the retail price and the transaction cost for going to the retailer and getting the drug there.

* To the consumers, they see the drugs from retailer 1 and the products from retailer 2 as identical. So their maximum willingness to pay is:

Questions

1. Write down the problem as a VI and solve it. Fill in the following table:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
| 5.412 | 5.412 |  |  | 82.763 | 82.763 |  |
|  |  |  |  |  |  |  |
| 5.412 | 5.412 |  |  | 89.175 |  | 10.824 |
| Profit(M1) |  | Profit(R1) | Profit(R2) | CS(B1) |  |  |
| 290.862 |  | 58.611 | 58.611 | 58.585 |  |  |

1. Suppose the patent expires. A manufacturer M2 can enter the market and produce the drug at the following production cost:

The transaction cost facing M2 is the same as that facing M1.

Solve the VI problem again and fill in the following table:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
| 3.730 | 3.730 | 3.108 | 3.108 | 71.647 | 71.647 |  |
|  |  |  |  |  |  |  |
| 6.838 | 6.838 |  |  | 86.323 |  | 13.676 |
| Profit(M1) | Profit(M2) | Profit(R1) | Profit(R2) | CS(B1) |  |  |
| 137.102 | 115.918 | 93.545 | 93.545 | 93.525 |  |  |

1. Suppose M1 is given the option to extend the patent for 10 more years, so as to keep the new entrant out of the market. If you were M1, what is the maximum amount that you are willing to pay for the extension of the patent? (assume all the above calculations are on annual basis and a discount rate of 5%)

Net present value of the difference in profits between the two scenarios:

Annuity (290.862-137.102) for ten years, discounted at 5%

= 153.76/0.05\*(1-(1/1.05)\*\*10) = 1187.294.

The patent will bring this extra profit in the coming ten years.

1. Suppose a new drug (which has very similar effects as the existing drug on patent) has released. What do you expect with the answer of the previous question? Rewrite the model so that it reflects this change, and redo the calculation.

The new drug entering the market means that a new substitute is available. The demand elasticity of this existing drug increases (more elastic). This can be reflected in the demand function:

We know that this will mean the patent is less valuable because M1 is facing more competition from similar products.

(Note: compare the profits with the new demand function, not the old one as the base)

Profits with patent = 127.006

Profits without patent =60.614