Abstract.

1. What is the Price Discrimination and what it means and where is it used in daily life
2. Where is the Price Discrimination used, for example we could talk about eBay
3. Definitions about buyers, sellers and their laws
4. How important is the cryptography in this system (about price discrimination protocol)
5. Importance of keeping the prices in secret for seller (security of used protocols)
6. Problems of Price Discrimination between different countries, compare the different standard of living
7. What does it mean for future, is this the future? All markets will be working in future on this way?

1. Introduction

1.1 Definition of discrimination

In general, discrimination is the discernment of qualities and rejection of people or things with undesirable qualities. Although the term "discrimination" has negative (e.g. racist, sexist) connotations, the literal meaning of the word "discrimination" (from discriminatio, "a distinction") is neutral. "Price discrimination" is a technical term meaning only differentiation in price by customer, and is not intended as an accusation of criminal or unfairly biased behavior.
1.2.1 Definition of Price Discrimination

Economically, price discrimination is usually regarded as desirable, since it often increases the efficiency of the economy. That is why it is frequently promoted by governments, either through explicit mandates or through indirect means. On the other hand, price discrimination often arouses strong opposition from the public. Price discrimination exists when sales of identical goods or services are transacted at different prices from the same provider. In a theoretical market with perfect information, no transaction costs or prohibition on secondary exchange (or re-selling) to prevent arbitrage, price discrimination can be a feature only of monopoly markets. Otherwise, the moment the seller tries to sell the same good at different prices, the buyer at the lower price can arbitrage by selling to the consumer buying at the higher price but with a tiny discount. However, market frictions in oligopolies (oligopoly is a market form in which a market or industry is dominated by a small number of sellers) such as the airlines, and even in fully competitive retail or industrial markets allow for a limited degree of differential pricing to different consumers. Price discrimination also occurs when it costs more to supply one customer than it does another, and yet the supplier charges both the same price.

1.2.2 Different Types of Price Discrimination

a. First Degree Price Discrimination - this involves charging consumers the maximum price that they are willing to pay. There will be no consumer surplus. First degree price discrimination takes place when differential prices are targeted to individual consumers. This strategy depends on estimating individual reservation prices more than recognizing actual individual identities.

b. Second Degree Price Discrimination - This involves charging different prices depending upon the quantity consumed. E.g. after 10 minutes phone calls become cheaper. Second degree price discrimination implies that customers willingly choose to pay differential prices for different versions or quantities of a good or service. This form of differential pricing therefore does not rely on individual information or on any form of traceability across different transactions or identities to be enforced. It can be implemented even when customers adopt untraceable, unlinkable anonymous payment strategies that shield any personal information (including online information, such as email accounts or IP addresses).

c. Third Degree Price Discrimination - This involves charging different prices to different groups of people. E.g. students, OAPs and peak travellers etc.

1.3 Where is it used

Some instances of price discrimination are not visible to the public, except through indirect effects. For example third degree price discrimination, changing gas stations prices that depend on the “zones” where the stations are located, towns located in different part of a state. Look at the prices at gas stations in Bratislava the gas costs 39.20 SKK, at same time in Kosice gas costs 37.50 SKK, tank full (50 liters) in Bratislava is 1960 SKK, in Kosice is 1875 SKK, difference is 85 SKK, you will pay 4.5% more in Bratislava. While it is not known publicly how prices for different zones are derived, one can expect that they are based on prior experience, presence of competition, and demographics of a zone.
To illustrate the benefits of first degree price discrimination consider the following scenario: the seller wishes to sell advertised good expecting total revenue of $\rho = 1200$ SKK. Three buyers express interest for the product with respective prices $v_1 = 300$ SKK, $v_2 = 500$ SKK and $v_3 = 700$ SKK. Without price discrimination the seller can set an average price of $1200/3 = 400$. This will result in a revenue of $800$ SKK that is below the expectations of the seller (this is because the product would be too expensive for the first buyer). In the perfect price discrimination setting the total revenue is $1800$ SKK but it is quite likely that the third buyer will not be willing to pay $400$ SKK more than the first buyer for the same product (and similarly for the second).

2. First Degree Price Discrimination in E-markets

2.1 Electronic commerce

Electronic commerce, commonly known as e-commerce or eCommerce, consists of the buying and selling of products or services over electronic systems such as the Internet and other computer networks. Computer science and cryptography study manipulation and exchanges of information in the electronic world, based on the computational model and computational environment constraints. In this work we investigate the concept of using cryptographic protocols to solve problems of economics: markets, exchanges and collaboration of agents, can be assisted in various environments where exchange and combination of information is done in a setting that due to partial-information constraints cryptography can help.

2.2 eBay

eBay is the shopping website with online auction business model which participants bid for products and services over the Internet. Like most auction companies, eBay does not actually sell goods that it owns itself. It merely facilitates the process of listing and displaying goods, bidding on items, and paying for them. It acts as a marketplace for individuals and businesses who use the site to auction off goods and services.

On the eBay people are bid for some kind of product, but also other users bid to. This based on second-price auction, where highest bid wins, but pays second highest price. Importance of being invisible to each other in bidding is very high. They never see how much the higher bid is, but if they win, they will be happy owners of something for the second higher price. Buyers may get into the habit of winning the products for a best price. After time the primary reason of bidding is not to own something for the better price, but relieve the feel of a winner. It is very optional for seller's surplus.

Auction formats

If you enjoy the interaction of bidding and the fun of winning a treasure or a great bargain, investigate the following ways of buying.

- **Auction-like Listings** – These include Reserve Price Auctions and Private Auctions.
- **Second Chance Offer** – Under certain circumstances, the seller can offer the item to a bidder other than the auction's winner.
- **Multiple Item Auction** – Listing that offers two or more identical items.
- **Specialty Sites** – eBay Live Auction and eBay Motors.
Fixed price formats

If you want to pay a fixed price and get the item quickly, learn about these buying formats:

- **Buy It Now** – Sellers have the option to offer a Buy It Now price that allows a buyer to get the item right away without waiting for an online auction to end.
- **Best Offer** – Sellers can choose this option to a Buy It Now listing so that buyers can suggest a price they are willing to pay for that item.
- **Specialty Sites** – Half.com by eBay and eBay Stores.

Advertisement formats

These buying options do not directly list an item for sale. They help connect buyers with sellers.

- **Classified Ads** – Instead of bidding as you would in eBay's auctions, interested buyers contact the seller using email or telephone (depending on the category).
- **Specialty Sites** – The Want It Now site is a place where buyers can tell sellers exactly what they want to buy.

3. Buyers, Sellers and their laws

3.1 User agreement in e-bay

While using the Sites, we will not post content or items in an inappropriate category or areas on the Sites; violate any laws, third party rights, or eBay’s policies; manipulate the price of any item or interfere with other user’s listings; fail to deliver payment for items purchased by us; post false, inaccurate, misleading, defamatory, or libelous content (including personal information); transfer your eBay account (including feedback) and User ID to another party without our consent; copy, modify, or distribute content from the Sites and eBay's copyrights and trademarks; use the Sites if you are not able to form legally binding contracts, are under the age of 18, or are temporarily or indefinitely suspended from our Sites; ‘Law and Forum for Disputes - This Agreement shall be governed in all respects by the laws of the State of California as they apply to agreements entered into and to be performed entirely within California between California residents, without regard to conflict of law provisions. You agree that any claim or dispute you may have against eBay must be resolved by a court located in Santa Clara County, California, except as otherwise agreed by the parties or as described in the Arbitration Option paragraph below. You agree to submit to the personal jurisdiction of the courts located within Santa Clara County, California for the purpose of litigating all such claims or disputes. Arbitration Option - For any claim (excluding claims for injunctive or other equitable relief) where the total amount of the award sought is less than $10,000, the party requesting relief may elect to resolve the dispute in a cost effective manner through binding non-appearance-based arbitration. Improperly Filed Claims - All claims you bring against eBay must be resolved in accordance with this Resolution of Disputes Section. All claims filed or brought contrary to the Resolution of Disputes Section shall be considered improperly filed. Should you file a claim contrary to the Resolution of Disputes Section, eBay may recover attorneys’ fees and costs up to $1000, provided that eBay has notified you in writing of the improperly filed claim, and you have failed to promptly withdraw the claim.'
3.2 eBay privacy policy

EBay may collect and store the following personal information: email address, physical contact information, and (depending on the service used) sometimes financial information, such as credit card or bank account numbers; transactional information based on your activities on the sites; community discussions, chats, dispute resolution, correspondence through our sites, and correspondence sent to us; other information from your interaction with our sites, services, content and advertising, including computer and connection information, statistics on page views, traffic to and from the sites, ad data, IP address and standard web log information; information from other companies, such as demographic and traffic data;

3.3 Security

Our information is stored on eBay servers located in the United States. They treat data as an asset that must be protected and use lots of tools (encryption, passwords, physical security, etc.) to protect our personal information against unauthorized access and disclosure. However, as we probably know, third parties may unlawfully intercept or access transmissions or private communications, and other users may abuse or misuse our personal information that they collect from the site. Therefore, although they work very hard to protect your privacy, they do not promise, and we should not expect, that your personal information or private communications will always remain private.

4. About price discrimination protocol[1]

- Active Participants: The Seller \((S)\), the prospective buyers \((B_1, ..., B_n)\). All communication takes place through a “bulletin board,” a model that abstracts away all lower level communication details.
- Inputs: the expected revenue \(p \in \mathbb{Z}\) of the Seller. The maximum amount that player \(B_i\) is willing to spend \(v_i\).
- Output: The seller computes the total contribution \(\sum_{i=1}^{n} v_i\). Each buyer either.

1) receives the discounted price \(v'_i\) hat has the properties (i) \(v'_i \leq v_i\), (ii) \(\sum v'_i = p\).
2) receives a notification that the expected revenue of the Seller has not been met.

- Correctness. Each active participant computes the outputs as specified above.
- Security Specifications.
  1. Privacy. The initial amount that each Buyer is willing to spend is kept secret (modulo the information that is leaked by the results of the procedure). Formally, privacy is intended to be shown by comparison to the ideal implementation of the scheme using a trusted third party: All buyers and sellers transmit privately their values to the trusted third party who announces the output as defined above.
  2. Robustness. No participant can prevent the procedure from terminating.
  3. Verifiability. Participants’ actions can be verified to follow the protocols’ specifications.
As explained above, we will consider two discount schemes: (i) absolute discount where

\[ v'_i = v_i = \frac{\sum_{j} v_j}{p} , \]  

and (ii) weighted discount where

\[ v'_i = v_i - \frac{p}{\sum_{i=1}^{n} v_i} . \]

Remark that in the absolute discount case, some buyers may compute a negative value as their final price \( v'_i \). This is not inconsistent with the specifications of price discrimination with absolute discount (i.e. in this case these buyers may end up getting some credit for participating in the procedure). Meeting the security specifications will rely on assuming the semantic security of Paillier scheme, and on the assumptions (and idealized model, if used) needed for the proofs of knowledge (as explained above).

5.1 Security of used protocols

On the Internet, Nobody Knows You're a Dog

6.1 Problems of Price Discrimination between different countries

In short, it's between two people from different country with different financial situation. Mr.G from GB and Mr.E from Ethiopia. They willingness to pay for a pen is different. Theoretically we have a world wide online store. So Mr.G for the same pen may pay 100 times much. Conclusion, they can't sell the same thing on the same price. Problem is how to hide from Mr.G the price which is acceptable for Mr.E. Mr.E could have the same pen for 1/100 of Mr.G's price.

7.1 Future

The public's dislike of price discrimination will be combined with new tools for detecting price discrimination. These tools are products of the same technologies that enable sellers to practice differential pricing. (The recent Amazon.com experiments with variable pricing were noticed and publicized almost immediately.)
The result is likely to be that price discrimination will grow, but in a concealed form. Stress will be on tactics such as bundling and loyalty programs, which tend to disguise the actual price that is charged. This means that auction mechanisms and micropayments are likely to be used in very limited situations. On the other hand, there will be continued pressure to erode privacy in order to find out just what the willingness to pay is, as well as to control how products and services are used. Thus privacy will continue to erode.

REFERENCES
2. Alessandro Acquisti: Price Discrimination, Privacy Technologies, and User Acceptance