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Automated personalised pricing practices online

Online trade is part of our everyday lives. Purchasing goods or services online is just as easy and comes just as naturally as browsing through the Internet or paying by card at the checkout counter. Buying and selling online becomes more and more widespread – and why should it not? It is quick, convenient, easy, and allows accessing a lot wider range of products than the storage space of any traditional shop would allow. It has become really easy to find the best bargain: one does not have to take a trip from one store to another to compare prices, now we can just open the website of one seller after another, or – even more convenient – check out one of the many price comparison sites online. Therefore, we could conclude that online shopping enables us to find better deals with less effort than conventional shopping methods would allow. But does it really? Do we know for certain that our efforts have paid off and we got the best price available? Are we unknowingly subjected to a clever scheme where vendors sell their products to us on the best price *for them* that we are willing to pay? In the year 2000, when online shopping was much less common than it is today, an unsuspecting shopper came upon an interesting phenomenon.[1] He ordered a DVD from Amazon, one of the first and biggest online shopping sites that had only very recently begun selling DVDs. He paid the price of $24 for it, and was satisfied with the bargain. The next day he visited the same site again, and stumbled upon the same DVD he bought, but this time the price of the product was $26. Usually such anomalies are often disregarded, as it probably was by several other customers before. But this

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[1] On the web, price tags blur. The Washington Post, 2000. https://www.washingtonpost.com/archive/politics/2000/09/27/on-the-web-price-tags-blur/14daea51-3a64-488f-8e6b-c1a3654773da/?utm_term=.8bddfbe6f303 (accessed 01.12.2017).

time he wanted to get to the bottom of it and find out the cause of the difference. He deleted his browser history and all of the cookies stored on his computer, and visited the shop again. He was puzzled when he found out that now Amazon offered the same DVD to him for only 22 dollars. News of his experiment spread quickly on online forums, and commenters began to suspect that the online store played a game of price discrimination in that case, offering the same product at different prices to first-time visitors and old customers. When the shop identified him as a returning buyer, he was offered a higher price since he would probably still be willing to pay that and not take his business elsewhere. And when he deleted his browser history, the website probably identified him as a first-time visitor and gave him a lower price in order to lure him into the shop. As the news spread along the online community and more and more outraged buyers commented on the story, Amazon was forced to react and they issued an official statement. The company claimed that a "random pricing experiment" was taking place at that time, and shoppers were offered a randomly selected price for products, without any regard to their previous behaviour on the site. They denied being involved in price discrimination practices. The truth may never have come to light, since online shops keep their pricing practices and website algorithms strictly secret, as it is one of the key elements of their business.

Since that early mention online price discrimination and personalised pricing have been discussed several times, and almost all of the major online shopping sites have been accused of such practices. In this paper we are going to examine the economics of price discrimination, and the ways it can be carried out in an online shopping environment. Finally, we assess the question whether personalised pricing is illegal, immoral, or just something we do not feel entirely comfortable about.

What is price discrimination?

In order to proceed, we need to have some basic understanding of the economics of markets, pricing, and price discrimination. In competitive markets, similar products tend to have prices on a range. Buyers, even under the best conditions, have imperfect information on the best prices available for them. Consumers have to put effort into researching the prices of similar products, which usually impose costs on them.[2] Sellers, however, have to adopt some sort of price discrimination practice in order to gain prof-

[2] Stiglitz, Joseph E.; Salop, Steven C.: The Theory of Sales: A Simple Model of Equilibrium Price Dispersion with Identical Agents. "The American Economic Review" 72, December 1982, pp. 1121-1122.

it from the higher paying customers. In order to do so, some prerequisites have to be satisfied. Firstly, the seller must have at least a small measure of market power, even if only for a short while, in order to be able to set the price of the product above marginal costs. Secondly, the seller must have some control over the sale of the product, and resale must be impractical, costly, or forbidden to prevent arbitrage between customers. Thirdly, and crucially, the seller must have some way to distinguish between the consumers according to their different price elasticities of demand for goods or services in order to know which price to charge to whom.[3] With these conditions set forward, we shall examine the concept of price discrimination. In the theory of economics, three kinds of price discrimination are detailed.[4]

First-degree price discrimination or "personalised pricing" refers to the practice where the seller sets a different price for each individual customer. This price is near to the reservation price (his maximum willingness to pay for it) of the buyer in question, so first-degree price discrimination enables the sellers to extract all consumer surpluses. In such sales, the buyer becomes a 'market of one' for the particular offer, the seller can make a take-it-or-leave-it offer for each buyer, through which he tries to extract the maximum profit from the transaction. Highly personalised or individual goods or services are also described with first-degree price discrimination, but in the followings we would not regard it as such.

Second-degree price discrimination, or "non-linear pricing" / "menu-pricing", is the price that differs between different quantities or qualities of a product, but not among different buyers. Second-degree price discrimination may refer to practices such as discount prices for large quantities of a product or products bundled together. Another second-degree price discrimination method is the 'versioning' of products when different versions of the product are offered for different levels of usage. Second-degree price discrimination practices always have the buyer himself select the price level of the product that best suits his needs from a menu of options available to him, and the seller does not need to know anything about the customer in order for it to work.

Third-degree price discrimination, or "group pricing", refers to selling identical products at different prices to different consumers identified by group traits or characteristics. Examples of third-degree price discrimination are discounts to students and seniors, or geographic zone pricing. This practice makes use of the general tendency of members of certain groups to pay more or less for a product. In this case, it is not necessary for sell-

[3] Varian, Hal R., Price discrimination. In Schmalensee, Richard– Willig, Robert D. (eds.), Handbook of industrial organization. Elsevier–Amsterdam 1989. Vol. I, pp. 597–654.

[4] A. Miller, Akiva, *What Do We Worry About When we Worry About Price Discrimination?* "Journal of Technology Law and Policy" 2014, Vol. 19, p. 54.

ers to recognize individual buyers: they only need to know the characteristic of the buyer that is used to discriminate prices.

In the scientific community it is generally acknowledged that real first-degree price discrimination is for textbook purposes only, because it requires the seller to know a great many details about each individual customer's habits and preferences, which is simply impossible to carry out in real life scenarios, and sellers cannot learn the buyer's exact reservation price. First-degree price discrimination serves as a stylized benchmark to evaluate other pricing schemes. The closest one can get to personalised pricing was a sophisticated third-degree price discrimination scheme, in which the seller allocates his buyers to some very characteristic groups, which can still be easily distinguished from each other, and set different price level for each group.

If we look at the result of such practices, we can see that this is a very powerful tool for sellers to maximize their income and compensate for market inconsistencies and imperfections. Let us take a look at a simple example[5] to illustrate this; let us imagine a monopolist who supplies a good with constant marginal production cost of €5 to a market of 100 customers. Half of these customers are high spenders, willing to pay an amount between €15 and €20 for this product; the other half (low spenders) are willing to pay between €8 and €10. Without any form of price discrimination, the seller would have to consider two uniform price points. If he sells his product at €8, all customers are buying, and he sells 100 units, making a profit of €3 per unit, €300 in total. On the other hand, if the vendor sells at the higher price of €15, he sells only 50 units to high spenders but makes a profit of €10 per unit, yielding a profit of €500. In the first example, low spenders have a consumer surplus (the difference between their willingness to pay and what they actually pay) of between €0 and €2, and high spenders between €7 and €12. Total consumer surplus at this price is €525. In the second scenario high spenders have a consumer surplus between €0 and €5, total consumer surplus is €125, and it leaves half of the population (the low spenders) unsupplied. Without price discrimination, the seller will most certainly set the price of the product to €15, selling fewer products, but making higher profit than he would make if he set the price low. This would leave the low spenders unsupplied, even if they are still willing to pay more for the product than the marginal cost of production (so the seller would not be selling at a loss). Now if we bring price discrimination in the scenario, and the monopolist can charge €15 to high spenders and €8 to low spenders, the outcome will leave the seller better

[5] Source: Zuiderveen Borgesius, Frederik; Poort, Joost: Online Price Discrimination and EU Data Privacy Law. Journal of Consumer Policy September 2017, Vol. 40, Issue 3, pp. 353-354.

off than any scenarios with uniform pricing. Total profits become 50 × €10 + 50 × €3 = €650, total consumer surplus becomes 50 × (€17.5–15) + 50 × (€9–8) = €175. This latter scenario, however, leaves no one unsupplied. On the other hand, for some customers, price discrimination will lead to higher prices than a uniform price. As it can be seen from the above example, price discrimination deprives some consumer groups of some of their consumer surplus. The more refined the price discrimination scheme that the seller uses, the more he can deprive consumers of their consumer surplus.[6]

Another interesting effect of this practice concerns competition on the market. Whereas selling at an uniform price (at €15, since this is the optimal price from the vendor's point of view) leaves some of the population unsupplied, and a competitor willing to sell at a lower price may enter the market. In the price discrimination scenario there is no room for competitors, the whole market is supplied with goods, both high spenders and low spenders are offered a price that they are willing to pay for the product. Price discrimination can make it possible to monopolize the market and make it unattractive for potential competitors to enter.

Price discrimination is an existing commercial practice, widely discussed in economic literature, its theory is well established, as well as there exist several textbook examples. In order to compensate for market inequalities and the diversity of real-life customers, most vendors engage in some kind of price discrimination practice, whether it is discounts for certain groups, bulk sale discounts, or just season finale sales. Second and third degree price discrimination is common in both online stores and plain old-fashioned shops. What recent years brought along is the prevalence of online shopping, more sophisticated algorithms, and the computational ability to collect and process incredibly large amounts of data about customers. These combined have led to online sellers being able to engage in actual personalised pricing, or such sophisticated third-degree price discrimination practices that are on the borderline of first-degree price discrimination. Next, we will examine the personalised pricing methods of online sales.

How does personalised pricing happen in online trade?

As we have discussed above, genuine personalised pricing requires the seller to have enough information about the buyers' habits, preferences and willingness to pay to be able to determine the reservation price of each customer. This seems to be possible these days, using the vast amount of information available on the Internet, some shared willingly by the user,

[6] Zuiderveen Borgesius, Frederik; Poort, Joost: Online Price Discrimination and EU Data Privacy Law. Journal of Consumer Policy September 2017, Volume 40, Issue 3, p. 354.

some acquired from databases, data brokers and social network sites, and some retrieved by checking the digital fingerprint (browser and OS information, geographic data, cookies, etc.) of the computer used to log in to the online shopping website. These data combined give access to more information about the buyer than the seller ever have hoped for. It is now only the question of a proper algorithm and the sufficient computational power to create a personal profile detailed enough to be able to tell the seller the vital information needed to calculate a personalised price very near the actual reservation price of the buyer. There are, however, some serious obstacles preventing successful first-degree price discrimination to happen. Perfect first-degree price discrimination not only requires a perfect monopoly without competitors, which is almost impossible in real life situations, and also sellers generally lack in sufficient information about the buyers' exact maximum willingness to pay and therefore cannot set the price exactly at the highest level possible. In the practice, online personalised pricing has not much to do with the consumer's maximum willingness to pay, other factors come to the picture.[7] So what is the information sellers want in a competitive situation in order to engage successfully in the price-discrimination practice?

First, the seller must know how buyers would react to a discount provided by their competitor. In order to get this information, the vendor has to determine whether his consumer belongs to the 'weak market' or the 'strong market'. Consumers belonging to the strong market are price insensitive and are willing to pay more for the product, whereas weak market customers are not as loyal to the vendor, they are rather price sensitive and are willing to pay less.[8] It is usually advantageous for sellers to offer discounts to the segment of consumers most likely to switch away in response to a rival's discount. Vendors need information in order to set their prices so that weak market customers can be attracted to their shop and away from competitors, whereas if strong market buyers receive higher prices, they probably will still not take their purchase elsewhere. In real life, of course, buyers are not divided into exact categories, rather they are on a spectrum between strong and weak market, and their relative position should be determined.

The easiest and often the best way to identify the strong and weak markets is by looking at the purchase history of the consumer in the particular shop. For most vendors, regular customers form the strong market, whereas first-timers are the weak market they need to attract. Sellers offer price

[7] A. Stole, Lars: Price Discrimination and Competition. In Schmalensee, Richard; Willig, Robert D. (Eds.), Handbook of industrial organization. Amsterdam, Elsevier, 1989. Vol. III, p. 2228.

[8] A. Miller, Akiva: What Do We Worry About When We Worry About Price Discrimination? Journal of Technology Law and Policy, Vol. 19, 2014. p. 58.

discounts to first-time buyers to win them, and often offer different kinds of discounts (e.g., a loyalty scheme) or other advantages (e.g., easier "one-click" purchase, quicker delivery) for regular customers in order to prevent them from switching to the competition.[9]

The next thing enabling price discrimination is the buyers' search costs. Consumers do not know all the available prices at stores and online shopping sites, but they have some general expectations about the distribution of prices in the market. Their basic assumption is that there is at least a rational chance that the price they are about to pay is a good bargain. A buyer with no knowledge of market prices however would never know if he is overpaying or getting a good deal.[10] Search costs in the online shopping scene do not necessarily mean actual spending, and are not always the person's choice; people who may have no computer skills, limited Internet access or may be lacking in the ability to visit many shopping sites should also be considered to be individuals with higher search cost. If they are price-sensitive buyers, when confronted with a price higher than they are willing to pay, they simply leave the market and make no purchase.

What we discussed above in theory is easy to put into practice. Identifying regular customers is not even a sophisticated calculation: all online shops require buyers to create a user account in order to make the purchase. If a user logs in into his account a second time, he is identified as a regular customer from that time on. Even if he does not use his account for some time, all his previous purchase information and account history is stored.

Assessing the price sensitivity of a customer (the strong and weak markets) is a bit trickier question, but is not overly complicated. Identifying price sensitive buyers and buyers who invest time and effort into searching for the best bargain is usually done by looking at the previous behaviour of the individual. The easiest to track is the purchase history and general behaviour of the buyer who logs in to his account at the site. If a user is seen looking at and buying luxury products regularly, without searching for cheaper alternatives or second-hand prices, he can be tagged as a price insensitive customer, and the seller should not worry about losing him if he charges a higher price the next time this person logs in. This surcharge would be pure profit for the seller. On the other hand, if the owner of an account does not buy many things on the site, always looks at second hand bargains and cheaper alternatives, the seller may put him in the weak market category, and try to win him over by offering discounts the

[9] It has been noted that even small advantages have a strong 'lock-in effect' on regular customers. See: Acquisti, Alessandro; R. Varian, Hal: Conditioning Prices on Purchase History, Marketing Science 24. (2005). pp. 379-380.

[10] A. Miller, Akiva: What Do We Worry About When We Worry About Price Discrimination? Journal of Technology Law and Policy, Vol. 19, 2014, pp. 61-62.

next time he visits the site. With each individual purchase the seller makes less profit, but by acquiring a new customer and aggregating all the sales he would not have concluded without the new buyer, the vendor is still better off.[11] As the history of an account provides valuable information, so does the web browsing history of an individual. By tracking cookies, cookies from other sites and web browsing history provided by the user's computer, the person's previous online behaviour can be easily assessed. If he visits price comparison sites, or the sites of the competition, he can be categorised as a price sensitive buyer, and the seller can offer him discounts in order to win him over. Recent studies have shown that browsing history provides for a more accurate prediction of a buyer's attitude than his demographic data or geographic location.[12]

Legal concerns of online personalised pricing

Finally, after looking at the economic theory of and practical approach to personalised pricing practices in the online shopping arena, we should assess the legal implications of such a behaviour. Starting from the point of view of consumers, it is highly disliked. Studies have shown that customers are wary of personalised pricing practices based on their past behaviour, even if the difference in pricing is in their favour.[13] Consumers are also less likely to make a purchase when they regard the price as unfair.[14] It appears that many people are uncomfortable with personalized pricing because it can happen surreptitiously.[15] From the legal point of view, there are a few arguments that need to be discussed if we want to determine whether such practices are illegal. First, such a behaviour may violate antitrust regulations by making it difficult or even impossible for new competitors to enter the market, thus creating a monopoly. This argument may be valid, but it is only half the story. When engaging price discrimination practices, vendors are facing a prisoners' dilemma. They assume that their competitors will engage or are already engaged in personalised pricing, therefore

[11] Zuiderveen Borgesius, Frederik; Poort, Joost: Online Price Discrimination and EU Data Privacy Law. Journal of Consumer Policy September 2017, Volume 40, Issue 3, p. 357.

[12] Shiller, Benjamin Reed: First-Degree Price Discrimination Using Big Data. No. 58, Working Papers from Brandeis University, Department of Economics and International Businesss School. p. 21.

[13] Turow J., King, J., Hoofnagle, C.J., Bleakley, A., & Hennessy, M. (2009). Americans Reject Tailored Advertising and Three Activities that Enable it. Annenberg School of Communications, Departmental Papers 9. (2009.)

[14] T.J. Richards, J. Liaukonyte, N.A. Streletskaya, Personalized pricing and price fairness. International Journal of Industrial Organization 44 (2016) 150.

[15] Big Data and Differential Pricing. Executive Office of the President of the United States, 2015. https://obamawhitehouse.archives.gov/sites/default/files/whitehouse_files/docs/Big_Data_Report_Nonembargo_v2.pdf (accessed 02.12.2017.)

they have to adopt such measures in order to prevent themselves from being pushed out of the market. They also try to win customers over by differentiating their product by providing better quality, more R&D or better customer service. Acknowledging this fact, we have to conclude that in a competitive market price discrimination not only is not reducing competition, but is actually increasing it. From the consumer protection point of view, we have to assess whether personalised pricing or price discrimination is a deceptive practice. We should conclude that such a practice is only deceptive if it constitutes a misrepresentation, that is the buyer relied on false information as a basic assumption underlying the bargain. It is plausible to argue that consumers care deeply about what other buyers pay for the same, but a buyer can seldom claim that he relied on the uniformity of prices as a basic assumption of the bargain.[16] Considering that consumers are aware that prices can differ from shop to shop, from a small town to a big city, we can easily see that this may not be a valid argument. Therefore this legal issue may as well be dismissed.

What the real concern is about, in my opinion, is the issue of privacy. Sellers use an infinitely large number of personal data in order to build a customer profile sufficient for applying personalised pricing. The collection and processing of such data has to be strictly regulated under the data protection laws of states or the European Union. The question is whether such data gathering always constitutes the processing of personal data. When the vendor assesses the buying history of a user registered to the online shopping site, it clearly falls in the category of personal data. But what about the user whose browsing history is assessed before he even creates or logs in an account on the site? European Data Protection Authorities say that a cookie with a unique identifier tied to an individual qualifies as personal data. This is because such cookies "enable data subjects to be 'singled out', even if their real names are not known."[17] Finally, what if sellers offer different prices for all buyers using a certain model of smartphone for browsing the Internet. The make and model of a device used for visiting a site may not constitute personal data by itself, and probably neither does offering a different price to them. But as soon as this price is tied to an individual during the purchase process, this entire behaviour becomes personal data processing.[18]

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[16] A.A. Miller, What Do We Worry About When We Worry About Price Discrimination? Journal of Technology Law and Policy, Vol. 19, 2014. p. 77.

[17] Article 29 Working Party (2010). Opinion 2/2010 on Online behavioural advertising (WP 171) and Article 29 Data Protection Working Party Opinion 4/2007 on the concept of personal data. 01248/07/EN WP 136.

[18] Zuiderveen Borgesius, Frederik; Poort, Joost: Online Price Discrimination and EU Data Privacy Law. Journal of Consumer Policy September 2017, Volume 40, Issue 3, p. 358.

Concluding the findings above, we should note that personalised pricing over the Internet does not constitute an unlawful activity by itself. Regulators have to be very careful however, because the behaviour of consumers may not be adapted yet to the rapidly spreading practice of paying for goods or striking better bargains by providing personal data to online entities. Tal Zarsky emphasizes that consumer myopia is one of the general problems with the use of personal information in marketing. Consumers do not have the means to assess the various advantages and disadvantages that may result from the surrender of their personal information. Online sellers often do not tell consumers how their information will be gathered, analysed and used, and consumers are unequipped to assess the repercussions that the sharing of their information could lead to.[19] The legislator has to provide sufficient means to the consumers to protect their privacy and disengage from any personalised pricing activity they are subjected to. This goal may be reached by making online vendors and data brokers clearly identify that the personal data of a visitor is used for personalised pricing, what its consequences are and how to opt out from this scheme.

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Zuiderveen Borgesius, Frederik; Poort, Joost: Online Price Discrimination and EU Data Privacy Law. Journal of Consumer Policy September 2017, Volume 40, Issue 3.

[19] Zarsky, Tal: Desperately Seeking Solutions: Using Implementation-Based Solutions for the Troubles of Information Privacy in the Age of Data Mining and the Internet Society, Maine Law Review 56, no. 1 (2004), pp. 40-46.

AUTOMATED PERSONALISED PRICING PRACTICES ONLINE

Abstract: The paper discusses the problem of practices of online automated personalised pricing in Internet-based trading. The first part concerns the economics of price discrimination; the second discusses the ways this can be carried out in an online shopping environment, and the third one deals with legal aspects of the personalised pricing online practice. Finally, the author tries to assess the question whether personalised pricing is illegal, immoral, or just something we do not feel entirely comfortable about.

Keywords: AUTOMATED PERSONALISED PRICING, PRICE DISCRIMINATION, ONLINE TRADE, LEGAL ASPECTS OF PERSONALISED PRICING