



Gender-based price discrimination in matching markets☆



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ABSTRACT

This paper develops a new model to analyze price discrimination in matching markets where agents have private information about their respective qualities. On the basis of signals (car, clothing, club membership, etc.) purchased from profit-maximizing firms, men and women form beliefs about each other's qualities. The matching must then be stable in the following sense: there cannot be a man and woman who are unmatched and who both *believe* they would be better off if they were matched with one another. The model enables an analysis of the impact of third-degree (or gender-based) price discrimination on welfare. When third-degree price discrimination is not feasible, the cost of eliciting private information is higher but a monopoly intermediary may have stronger incentives to implement an efficient allocation. I show that gender-based price discrimination is more likely to have a positive impact the more symmetric the matching environment is.

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1. Introduction

Men and women use signals to inform potential partners of their relevant characteristics. Such signals include premarital investment (education, culture, etc.), conspicuous consumption (expensive cars or clothing), membership to selective clubs or dating services, and more. In some of these examples, signals are provided by profit-maximizing firms.¹ This raises several questions: Do private firms have an incentive to provide an effective number of signals? What is their impact on the matching of men and women? Do current regulations (like a ban on gender-based price discrimination) have an impact on the provision of signals and, ultimately, on the matching of men and women?

In order to answer these questions, I will build a model in which men and women invests in costly signaling prior to matching. Based on their

choice of signals, men and women form beliefs about their potential partners' types. The model departs from the existing literature in that the matching depends explicitly on these beliefs. In particular, I assume that, in equilibrium, the matching must be (pairwise) stable according to the beliefs: there cannot be a man and a woman who *both believe* they would be better off being matched to one another compared to their current assignment. The advantage of this approach is that there is no need to model precisely how the matching occurs following signaling decisions.

Existing models in the literature on price discrimination in matching markets rely on a very precise description of how the matching occurs. Damiano and Li (2007, 2008) consider the following matching mechanism: a profit-maximizing matchmaker opens several meeting places – with different entrance fees – where agents are then matched randomly. Gomes and Pavan (2015) and Johnson (2013) adopt a mechanism design perspective and obtain results on the optimal mechanism. The drawback is that some questions are difficult to assess in these models. In this paper, I will illustrate the benefits of my approach by analyzing the impact of a ban on third-degree (or gender-based) price discrimination. The question is especially relevant in the light of recent debates concerning the legality of gender-based discrimination (see the discussion below).

Formally, I analyze a matching model with non-transferable utility and asymmetric information. Agents can be of two types, high or low, with the same ordinal preference: everyone prefers to be matched with a high-type agent. Before they can enjoy any gain from matching,

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¹ For instance, IAC operates three popular dating websites – OkCupid.com, Match.com and Chemistry.com – that can be ranked according to membership fees, \$0, \$35 and \$50 per month respectively: the most expensive offers are supposed to attract people interested in a long-term relationship, while more basic services are designed for casual daters. In addition, there are often different types of membership for a given website: for instance, users of Match.com can pay an additional \$5 per month to get their profiles highlighted, \$5 to become premium members, etc.

agents have to go through the service of a profit-maximizing matchmaker. When gender-based price discrimination is feasible, the matchmaker implements either an *exclusive* allocation, in which only high-type men and women participate, or a *separating* allocation, in which all men and women participate, and men and women are matched assortatively. The matchmaker faces a rent-extraction/efficiency trade-off. On the one hand, in an exclusive allocation, the matchmaker captures the entire high-type surplus, but is unable to capture the low-type surplus. On the other hand, in a separating allocation, the matchmaker captures the entire low-type surplus, but high-type men and women obtain an information rent.

When gender-based price discrimination is not feasible, the matchmaker offers the same set of prices on both sides of the market. The cost of information revelation increases: information rents are higher and some users who were left with zero surplus when gender-based price discrimination were feasible now receive an information rent. Suppose that high type men and women were offered p^m and p^w respectively. Then, when gender-based price discrimination is not feasible, if the matchmaker offers $\{p^m, p^w\}$ on both sides, it is possible that both the high-type men and women choose $\min\{p^m, p^w\}$ if this “signaling” strategy is dominated for low-type agents. In other words, either the high-type men or women now receive an *additional* information rent: $\max\{p^m, p^w\} - \min\{p^m, p^w\}$. I find sufficient conditions under which this additional “cost” to the matchmaker is higher in an exclusive allocation than in a separating allocation, and conversely. Because total welfare is maximal in a separating allocation, these conditions also indicate in which case gender-based price discrimination has a positive or negative impact on total welfare.

My paper is also related to the literature on matching tournaments (see, for example, Bhaskar and Hopkins (2011), Chiappori et al. (2009), Hopkins (2012), Hoppe et al. (2009), Mailath et al. (2011), and Peters and Siow (2002)) which examine how premarital investment or investment before trading shapes the matching of men and women, or buyers and sellers. Given that no restrictions are made on the set of signals, papers in this literature focus on the fully separating equilibrium which consists of the assortative matching of agents based on their signal choices. In most papers, the process by which agents end up being matched assortatively is not explicitly modeled, nor are the beliefs that sustain the equilibrium. My notion of stability provides a theoretical foundation for the separating equilibrium considered in the literature.

In addition, my paper is related to the literature on third-degree price discrimination. Economists have long noted that third-degree price discrimination may either reduce or raise social welfare:² in a monopoly market, moving from non-discrimination to discrimination raises a firm's profits, harms consumers in markets where prices increase, and benefits consumers who enjoy lower prices. I offer an analysis of the problem of a monopolist who can use both second-degree and third-degree price discrimination in a case where demands are interdependent. Layson (1998) and (Adachi (2002, 2005)) extend the classical analysis of third-degree price discrimination to the case of interdependent demands. The argument is as follows: suppose there are two groups of consumers and the only difference between the two groups is that the first one's participation exerts a positive externality on the second one. The optimal price structure in this case is that individuals of the first group pay a lower price, so that a ban on third-degree price discrimination is likely to reduce total welfare.³ In a one-

to-one matching market, the demands of men and women are positively interdependent, but intra-group participation externalities also occur: men compete to attract women, and conversely.⁴ Accordingly, some consumers may benefit from a price increase, and it is unclear whether one effect necessarily dominates the other, i.e. whether third-degree price discrimination is harmful or not.

Problems with both second- and third-degree price discrimination arise naturally in insurance markets. The literature on risk classification (Crocker and Snow, 2000) discusses the implication of third-degree price discrimination on efficiency and equity in insurance markets. The focus is on finding the insurance contracts that maximize consumers' welfare under the constraint that insurers make non-negative profits. Therefore, in some sense, I will consider the “dual problem” of the situation.

1.1. Debates on gender-based price discrimination

Gender-based pricing is prevalent in many industries (insurance, dry-cleaning, hairdressing, nightclubs and dating services, bars, clothing, etc.). The legality of gender-based price discrimination in matching markets – and of gender-based pricing in general – has been debated in the US since the 90s and in the EU more recently.⁵ The debate is not whether gender-based pricing may harm competition – a standard concern for competition authorities – but rather whether gender-based pricing is a form of gender discrimination. Gender-based pricing has indeed been criticized for conveying and reinforcing negative stereotypes about both women and men, especially in matching markets.⁶

In the US, gender discrimination in shops and services is an issue left to the states.⁷ This resulted in considerable variation in court judgments on gender-based pricing: whereas some courts have systematically ruled against gender-based pricing (California, Florida, Pennsylvania, Iowa and Maryland), others have adopted a case-by-case approach (Illinois, Washington and Michigan). This division among the courts has been debated by American jurists since the 90's. Opponents invoke a *de minimis* argument: courts should dismiss cases involving gender-based pricing because the plaintiff generally suffers very little damage.⁸ The economic efficiency of gender-based pricing is sometimes invoked,

⁴ The same intra-group externalities are examined by Rayo (2013), who analyzes the problem of a discriminating monopolist serving a population of consumers who use the goods as a signaling device (conspicuous goods).

⁵ For the US, see Joyce L. McClements and Cheryl J. Thomas (1986): “Public Accommodation Statutes: Is Ladies' Night Out?”, *Mercer Law Review*, 37; Heidi C. Paulson (1991): “Ladies' Night Discounts: Should We Bar Them or Promote Them”, *Boston College Law Review*, 32; “Civil Rights. Gender Discrimination. California Prohibits Gender-Based Pricing. Cal. Civ. Code §51.6 (West Supp 1996)”, *Harvard Law Review*, 109 (1996); Jessica Rank (2005): “Is Ladies' Night Really Sex Discrimination?: Public Accommodation Laws, De Minimis Exceptions, and Stigmatic Injury”, *Seton Hall Review*, 36; Mark A. Herzberg (2010): “Girls Get in Free: A Legal Analysis of the Gender-Based Door Entry Policies”, *South California Review of Law and Social Justice*, 19; Shana S. Brouwers (2011): “A Guy Walks Into a Bar: Gender Discriminatory Pricing and Admission Policies in Las Vegas Establishments”, *Nevada Law Journal*, 11.

For the EU, see the European Commission's reports “Sex Discrimination in the Access to and Supply of Goods and Services and the Transposition of Directive 2004/113/EC” and “Sex-Segregated Services” (2009), and Aileen McColgan (2009): “The Goods and Services Directive: a curate's egg or an imperfect blessing?”, *European Gender Equality Law Review*, 1.

⁶ The idea is that the fact that women usually pay less for matching services replicates a dominance/submission stereotype. More generally, sociologists and psychologists noticed that the organization of romantic relationships has shifted only slowly toward more gender equality. See Paula England (2010): “The Gender Revolution: Uneven and Stalled”; Janet Lever, David A. Frederick and Rosanna Hertz (2013): “Who pays for dates? Following versus Challenging Conventional Gender Norms”.

⁷ This is due to the fact that the word *gender* is not mentioned in the section of the Civil Rights Act of 1964 related to “places of public accommodation”: “All persons shall be entitled to the full and equal enjoyment of [...] any place of public accommodation [...] without discrimination or segregation on the ground of race, color, religion, or national origin”. Consequently, most states have enacted “local” legislations to ensure equal access to accommodations.

⁸ Rank, *supra* note.

² The analysis of third-degree price discrimination goes back to the seminal works of Pigou (1920) and Robinson (1933), later built on by Schmalensee (1981) and Varian (1985). More recently Aguirre et al. (2010) provided general conditions on the curvature of demand functions under which third-degree price discrimination has a positive or a negative impact on total welfare.

³ The analysis of such cross-group network effects is at the heart of the literature on multi-sided platforms (see, Armstrong (2006), Caillaud and Jullien (2003), Rochet and Tirole (2003, 2006)). Wright (2004) discusses informally the impact of a ban on third-degree price discrimination in these industries.

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