Privacy, Exposure and Price Discrimination

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This paper explores the demand for privacy that arises from the loss of consumer surplus when firms gain the ability to treat different consumers differently. It is shown that firms in quest of a competitive advantage may have an incentive to acquire consumer information and use it to gain exclusive access to finer consumer segments, even when the costs of customized marketing are exceedingly high. When such is the case, the opportunity arises for an intermediary to coarsen market access in order to protect consumer surplus and to bar firms from exercising price discrimination. This intermediary could be a mass retailer, a mass media or a diverse community. Formally, the paper analyzes the situation of an intermediary who owns a finer market access system, i.e., the capability to separately access two types of consumers who previously remained undistinguishable. The system could be made available to one firm in exclusivity, or to several firms (two instances of “exposure”), or to no firm at all (“privacy”). The best-bidding agent (from among firms, marginal-type consumers, and mainstream-type consumers) is buying the right to command the equilibrium access allocation. The solution involves either privacy (commanded by mainstream consumers) or exclusive exposure (commanded by a firm), depending intuitively on factors such as consumer involvement, homogeneity and adaptability, as well as the size of returns to scale in marketing and the extent of competition.

Keywords: Segmentation, price discrimination, privacy, exposure, intermediary, involvement, homogeneity, adaptability, returns to scale, competition, marketing.

JEL classification numbers: D0, D4, D6, D8, L1, L2, M2, M3

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1. INTRODUCTION

Technological advances allow firms to collect increasing amounts of information about consumer behavior, both online and offline. Based on that information, firms can expect to achieve greater precision in segmentation, and to create finely targeted value propositions.

This evolution generates both positive and negative reactions on the consumer side. Consumers generally value targeted products and the convenience associated with more efficient marketing techniques. However, constant monitoring inevitably raises privacy concerns that appear to be rooted in strong feelings and in deeply held principles such as the right to be left alone. As recently predicted in an article from *The Economist* (2003) appropriately titled “No Hiding Place”, “there will be constant arguments about what trade-offs to make between privacy on the one hand, and security, economic efficiency and convenience on the other.” This paper will focus on clarifying the relationship between privacy and economic efficiency.

For a sound debate on privacy to take place, a number of questions need to be addressed: Beyond the emotions and the principles, what are the more substantial causes of the privacy concern? Should this concern dominate the alleged economic benefits associated with the diffusion of consumer information? Finally, can there be a market solution to address the demand for privacy? The purpose of this paper is to provide a partial but consistent set of answers to each of these three questions.

The proposed answer to the first question is relatively straightforward. When various types of consumers are hit with undifferentiated products and undifferentiated prices as is customary under mass marketing, most consumers perceive a significant rent or surplus, caused by the fact that firms need to lower their price in order to appeal to the marginal consumers. In contrast, finer consumer information and access creates opportunities for price discrimination (targeted products and prices), which in turns jeopardizes consumer surplus for a fraction of consumers. This loss of consumer surplus is the proposed substantial cause of the demand for privacy (or market coarsening).

The second question is the most critical: Are there circumstances under which the lost surplus is so significant a force that it could override the benefits that firms derive from greater consumer discrimination? If there were no such circumstances, demands for privacy could arguably be viewed as unimportant resistance. In fact, firms are interested to seek finer consumer information and access only to the extent that it gives them a competitive advantage, resulting in a greater ability to extract profit. This paper will argue that, due to the increased ability to extract profit, firms have an incentive to acquire and use exclusive consumer information even when the cost of channeling their targeted offers is exceedingly high, as compared to the added value created for consumers through product customization. In other words, profit maximization through increased consumer targetability may result in the industry creating less value overall, which legitimizes consumer demands for privacy. In particular, this will occur when marketing costs are subjects to strong returns to scale, making efficient customization harder to achieve.

Finally, what would a market for privacy look like in this context? One needs to imagine suppliers of privacy, gatekeepers who effectively conceal finer consumer access, on behalf of
consumers, for the sake of fostering competition on the markets for products. Consumers would share with them part of the protected surplus. Such intermediaries would consistently and credibly resist the demands of downstream firms to allow for exclusive consumer access and price discrimination. The popular literature on online “infomediaries” (Hagel and Singer 1999) envisioned such entities, while questioning the conditions under which their pledge to protect privacy could be trusted (Scott Morton, Zettelmeyer and Silva-Risso 2001). In reality, one can readily acknowledge the existence of several types of intermediaries whose pledge to enforce competition among supplying firms and to maintain a high degree of access coarsening is ordinarily viewed as a credible departure from the secular trend towards finer segmentations and increased customization:

Retailers. Retailers sometimes sell exclusive access to their shelves based on consumer characteristics they have managed to isolate (e.g., club discounters appealing to certain consumer segments). However, other types of retailers foster product competition while maintaining coarse access to a variety of consumers who are all treated indiscriminately (e.g., large “everyday low price” department stores). The latter kind of retailers is an illustration of the emergence of a market-coarsening intermediary in the presence of returns to scale in marketing and relative consumer homogeneity.

Media. Fans of cultural products (e.g., music, TV series) gain a lot of surplus from being addressed in a way that does not distinguish them from less involved consumers. Thus, it is not surprising to see intermediaries in these domains pledging strong and usually believable privacy guarantees. For instance, a leading provider of digital video recording services finds that consumers would simply not buy the service if they believed that their individual preferences might be exposed.

Communities. One important function of communities (e.g., towns, alumni and professional associations) is to negotiate exclusive access with suppliers. However, communities also hold back from providing suppliers with finer information (e.g., information that could be relevant for policy customization and price discrimination in an insurance contract) when they know that the majority of their members want to remain hidden behind the community’s overall plural identity.

There seems to be two distinct trends in the existing literature on the economics of privacy. Some authors aim to demonstrate the economic efficiencies resulting from increased consumer exposure (e.g., Posner 1981, Cate 2002, Calzolari and Pavan 2001). Other authors, similar to this paper, aim to uncover substantial causes behind privacy concerns. In Taylor (2002), consumers anticipate that their current behavior can be used at a later time for price discrimination purpose. Taylor finds that the strategic behavior of consumers (who may reject offers in order to bias the perception of firms) would be so costly that both firms and consumers should welcome a privacy protection regime. In Taylor (2003), firms under competitive pressure acquire excessive amounts of information about consumers, in a context where consumers have to qualify to enter the market (as in an insurance market). This leads to inefficient levels of consumer disqualification, justifying a privacy rule. This argument is somewhat related to this paper’s proposition 1 (part 2), where a monopolist may abusively want to select marginal consumer groups out of the market in order to profitably focus marketing efforts on the most involved consumers. However,
for the most part, the present paper focuses on inefficient degrees of customization, whereby firms have an incentive to make several distinct targeted offers despite the presence of exceedingly high costs of customization.

In their study of the value of online information privacy, Hann et al. (2002) make the interesting observation (consistent with this paper) that not all consumers have the same interest in privacy protection, suggesting antagonisms among consumer groups (e.g., groups that Hann et al. call “privacy guardians” and “information sellers”) with respect to their preferences over marketing systems. This point was also illustrated in an ethnographic study by Holt (2002) that explores the resistance of marginal consumers confronted with brands that better match the preferences of the mainstream.

Overall, this paper complements other research in marketing that explored the profitability potential of increased consumer targetability. It has already been commented that competition among firms may ruin the profitability of finer segmentations (e.g., Villas-Boas 1999, Chen, Narasimhan, and Zhang 2001). Iyer and Soberman (2000) also explored how the strategic interests of a vendor of consumer information might interfere with the ability for competing firms to profit from that information. Adding another perspective, the present paper examines the influence that consumer surplus-seeking behavior can have (via an intermediary) on the ability of firms to command a competitive advantage based on privileged consumer access.

Formally, this paper assumes a profit-maximizing intermediary who owns a system capable of separately accessing consumer segments that were previously indistinguishable. The intermediary has to choose an optimal access allocation: should finer access be made public, or should it be negotiated with one firm in exclusivity? Or should privacy be preserved? To make that choice, the intermediary has to figure out which economic actor (consumer group or firm) is most willing to pay in order to influence the access allocation decision. In the spirit of the literature on technological competition (Dasgupta 1986), the actor with the greatest stakes in the access allocation process will win the right to command the intermediary. It results from this analysis that finer access systems should either be allocated to one supplying firm in exclusivity (i.e., exclusive exposure), or to no firm at all (i.e., privacy or market coarsening).

Whether exposure or privacy prevails depends on demand-side parameters of consumer involvement, homogeneity and adaptability, and supply-side parameters of competitive intensity (monopoly versus competition), economies of scale in marketing. Simply put, exposure should only result if it truly creates value, which requires contexts with less economies of scale, higher involvement, sufficient consumer heterogeneity and a relative lack of adaptability. In mundane product categories characterized by economies of scale, consumer homogeneity and adaptability, mainstream consumers should be able to successfully spend resources to protect uniform access. One implication of this analysis is that nondiscriminant access devices (e.g., mass retailers, diverse communities and mass media) should sometimes be expected to give privileged treatment to their marginal members who need to be compensated for staying unexposed.

The next section presents the model, including the characteristics of the consumers, the firms, and of the intermediary, as well as a definition of the equilibrium concept. Then, section 3 analyses the monopoly case, highlighting the fact that privacy contracts can correct for an
abusive use of finer market access by the monopolist. Section 4 analyses the competitive case and describes the conditions and features of privacy and exposure equilibrium. Section 5 concludes.

2. **MODEL**

The model involves three categories of agents: (1) two types of consumers (type-A and type-B), (2) a supply-side made of one firm (monopoly case) or more than one competing firms (competitive case) who can’t distinguish between the two types of consumers, and (3) an intermediary who owns a finer access system that allows firms to access type-A and type-B consumers separately.

This section describes these three categories of agents and introduces the equilibrium concept. The key decision of interest concerns the allocation of the finer market access system: how many firms will be allowed to use it, and who will pay the intermediary.

2.1. **Consumers**

Consider a market for two substitute goods, denoted by $A$ and $B$. There are $N$ consumers, who are on the market for one unit of good at most.

Some consumers (called type-A consumers) prefer $A$ to $B$: good $A$ for them is worth $v$, while good $B$ is worth $\gamma v$. For clarity, the analysis focuses on cases with $0.5 < \gamma < 1$. The other consumers (called type-B consumers) prefer $B$ to $A$: good $B$ for them is worth $v$, while good $A$ is worth $\gamma v$. Thus, each consumer is willing to pay up to $v$ to get the good she wants more, or $\gamma v$ for the good she wants less. In that sense, $\gamma$ is a measure of consumer adaptability.\(^2\) Parameter $v$ will occasionally be interpreted as a measure of consumer involvement.

There are $\alpha N$ type-A consumers and $(1-\alpha)N$ type-B consumers. Without loss of generality, $\alpha \geq \frac{1}{2}$ is assumed, so that type-A consumers are in majority. Type-A consumers will sometime be called “mainstream” and type-B consumers will sometime be called “marginal” consumers. Parameter $\alpha$ is a measure of consumer homogeneity in the population.

2.2. **Firms**

On the supply-side of the market, both monopoly and competitive situations will be considered. The cost to produce $A$ or $B$ is assumed to be zero for any firm. However, firms face an access cost (or, simply, marketing cost) incurred to present a consumer with a good. This cost includes activities related to making a good known and physically accessible to the consumer. In the baseline case, firms are assumed to know $\alpha$ but they are unable to access type-A and type-B individuals separately. The baseline access cost is denoted by $m$, so that addressing all consumers

\(^2\) The analysis will always result in supplying type-A consumers with what they want, and thus $\gamma$ as it applies to them may appear to be somewhat irrelevant. However, the parameter is kept to make clear that the only source of asymmetry between type-A and type-B consumers is their number.
with either good $A$ only or good $B$ only will cost a total of $mN$, and addressing all consumers with both $A$ and $B$ implies a total marketing cost of $2mN$ (this analysis omits the possible impact of economies of scope).

In order to focus on non-trivial solutions, it is assumed that $m \leq \frac{1}{2}v$. Collectively, these assumptions describe the baseline market access system $M$. Because it cannot distinguish between type-$A$ and type-$B$ consumers, $M$ will sometimes be described as a coarse access system.

2.3. **Intermediary**

The intermediary owns a finer market access system, denoted by $M'$, that allows firms to access type-$A$ and type-$B$ consumers separately. The implied access costs are denoted by $m'_A$ (average cost to access a type-$A$ consumer) and $m'_B$ (average cost to access a type-$B$ consumer). Thus, the total cost of accessing $A$-type consumers is $am'_A N$ (versus $mN$ under $M$) and the cost of addressing $B$-type consumers is $m'_B(1-\alpha)N$ (versus $mN$ under $M$). The average access cost under $M'$ is denoted $m' = am'_A + (1 - \alpha)m'_B$.

A finer access system could result, e.g., from a new store’s geographical location or specific appeal, a new media’s (e.g., television channel or magazine) specialized content, or a new community of consumers. Often, these systems will allow more efficient access to one consumer type without impacting the economics of accessing the remaining consumers. For the access system to be finer than the baseline system involving marketing cost $m$, access costs must be restricted as follows:

$$m'_A \leq \frac{m}{\alpha} \quad \text{and} \quad m'_B \leq \frac{m}{1-\alpha}.$$  

Returns to scale in marketing are assumed, so that $m'_B > m' > m'_A > m$. These assumptions imply that a finer access system must be a more economical way of offering variety, but it can’t be a more economical way to market a homogeneous offering.

2.4. **Equilibrium Concept**

The decision of interest concerns the intermediary. He can make $M'$ available to one firm, or to several firms, or he may decide to prevent finer consumer access. The allocation of access can be paid for by type-$A$ consumers, type-$B$ consumers, or by one or several firms. The transaction cost involved in contracting with any of these agents is zero. Possible problems of coordination among consumers of a certain type are assumed away for the purpose of this paper.

More formally, the decision of interest is an *access allocation contract*: an agent pays an amount $x$ to the intermediary and determines whether $M'$ is to be made available to no firm, one firm or more than one firm.
An *equilibrium access allocation* is defined as an access allocation contract that is acceptable for the agent involved and carries a payment $x^*$ to the intermediary such that no other agent could be willing to offer a better payment.

To determine the equilibrium access allocation, two stages are assumed. In the first stage, the intermediary picks an access allocation. In the second stage, firms determine what good(s) to offer and at what price(s) under the chosen access allocation. A comparison of second stage equilibrium outcomes reveals what the various agents would be willing to pay in order to favor any particular access allocation in the first stage. The equilibrium access allocation contract is then determined by backward induction.

3. **MONOPOLY CASE**

This section first identifies the monopolist’s equilibrium decision under coarse access. Then the impact of finer access is assessed, leading to a first proposition about access allocation.

3.1. **Baseline Monopoly Case**

In an ideal monopoly case, the firm could present each consumer separately with only his preferred good, leaving no surplus to consumers. However, the monopolist’s inability to distinguish among consumer types under access system $M$ leads to one of the three following second-best solutions, named after their impact on the demands of the minority consumers:

*Neglect.* Demands of type-$B$ consumers are neglected, because they are too rare to justify the corresponding access cost. All consumers are presented with good $A$ only, sold by the monopolist at price $p_A = v$. Expected monopoly profit per consumer is $\alpha v - m$. There is no consumer surplus. There is a waste of marketing costs (as compared to an ideal monopoly case) amounting to $m(1 - \alpha)N$, as type-$B$ consumers are addressed uselessly.

*Pooling.* All consumers are presented with good $A$ only, sold by the monopolist at price $p_A = \gamma v$. As a result, all consumers buy $A$, including type-$B$ consumers who compromise their preferences by buying a good that doesn’t match their type. “Mass marketing” could be a good label here, except for the fact that it has absolute size connotations that are irrelevant in this discussion. Monopoly profit per consumer is $\gamma v - m$. Consumer surplus in this case is $\alpha(1 - \gamma)vN$, as $A$-type consumers obtain their preferred good at a discount. There is no waste of marketing cost.

*Self-selection.* All consumers are presented with both goods and pick the one they like most. The monopolist sets prices $p_A = v$ and $p_B = v$. Monopoly profit per consumer is $v - 2m$. There is no consumer surplus. The waste of marketing costs amounts to $mN$, as compared to the ideal monopoly case.

The monopolist’s expected profit per consumer in the baseline (coarse access) case is therefore $\pi^* = \max(\alpha v - m, \gamma v - m, v - 2m)$, and conditions for the three possible equilibria can be summarized as follows:
**Lemma 1** (Monopoly equilibrium under coarse access)

In the monopoly case under coarse access system \( M \), the equilibrium is characterized by:

\[
\begin{align*}
\text{Neglect with } p_A &= v \text{ if } \alpha \geq \gamma \text{ and } m > (1 - \alpha)v, \\
\text{Pooling with } p_A &= \gamma v \text{ if } \gamma > \alpha \text{ and } m > (1 - \gamma)v, \\
\text{Self-selection with } p_A &= p_B = v \text{ if } m \leq (1 - \max(\alpha, \gamma))v.
\end{align*}
\]

Essentially, high homogeneity (\( \alpha \)), high adaptability (\( \gamma \)) or low access cost (\( m \)) each offer a path of salvation for a monopolist endowed with coarse market access. Remark that high homogeneity and high adaptability are substitute from the firm’s standpoint, while their impact from a consumer standpoint is radically different: pooling is preferred to neglect. Consumers should value a blend of diversity and tolerance for its impact on welfare.

### 3.2. Monopoly with Finer Access

The key impact of using a finer access system is to lower the cost of price discrimination, thereby making pooling (and consumer surplus) less likely. When the monopolist uses finer access system \( M' \) instead of \( M \), offering variety yields greater profit, i.e., \( (v - m')N \) instead of \( (v - 2m)N \), and so does neglect, i.e., \( \alpha(v - m')N \) instead of \( (\alpha v - m)N \). These two forces have been apparent in the real world, where progress in consumer information systems (e.g., through keeping track of customer responses over time) led to a trend in favor of either customer selection (neglect) or customization. The term “self-selection” is now an inadequate descriptor of the variety equilibrium, as the firm is able to identify consumer groups before they make a selection. The term “customization,” referring to the firm addressing both consumer types separately with their preferred good, is therefore adopted. The monopoly equilibrium is as follows (all proofs are in appendix):

**Lemma 2** (Monopoly equilibrium under finer access)

In the monopoly case under finer access system \( M' \), the equilibrium is characterized by:

\[
\begin{align*}
\text{Neglect with } p_A &= v \text{ if } \{ \alpha \geq \gamma \text{ and } v < m' \}, \text{ or if } \{ \gamma > \alpha \text{ and } v < \frac{m' - \alpha m'_A}{\gamma - \alpha} < m'_B \}, \\
\text{Pooling with } p_A &= \gamma v \text{ if } \{ \gamma > \alpha \text{ and } \max\left\{ \frac{m' - m}{1 - \gamma}, m'_B \right\} \geq v \geq \frac{m' - \alpha m'_A}{\gamma - \alpha} \}, \\
\text{Customization with } p_A &= p_B = v \text{ if } \{ \alpha \geq \gamma \text{ and } v \geq m'_B \}, \text{ or if } \{ \gamma > \alpha \text{ and } v \geq \max\left\{ \frac{m' - m}{1 - \gamma}, m'_B \right\} \}.
\end{align*}
\]

Acknowledging that \( v < m'_B \) is more restrictive than \( (1 - \alpha)v < m \) (neglect condition under Lemma 1 when \( \alpha \geq \gamma \)), it appears that a shift to finer access induces the monopolist to shift from neglect to customization in a number of situations. Acknowledging also that
\[ v \leq \max \left\{ \frac{m' - m}{1 - \gamma}, m' \right\} \] is more restrictive than \((1 - \gamma)v < m\) (pooling condition under Lemma 1), it appears that a shift to finer access induces the monopolist to shift away from pooling (either to neglect or to customization) in a number of situations, making the occurrence of consumer surplus less likely. Overall, a finer access system makes it more likely that marginal consumers get what they want. However, in a number of instances, marginal consumers will be confronted with neglect instead of an opportunity to consume the mainstream good.

3.3. Equilibrium Access Allocation

Availability of a finer access system creates a conflict between the monopolist and type-A consumers, whenever it may cause a shift away from pooling.

In order to induce an access allocation contract that allows him to shift from pooling to neglect, the monopolist is willing to pay up to \( (\alpha(v - m' + m)N = ((\alpha - \gamma)v + m - am'_A)N \). In response, type-A consumers’ resistance amounts to a bid equal to the lost surplus, \( \alpha(1 - \gamma)vN \). Comparing the two forces, it appears that the equilibrium access allocation may involve preventing the firm to use finer access (i.e., privacy or coarsening) if \( (1 - \alpha)v < m - am'_A \). In other words, privacy may emerge to protect the majority’s surplus when the monopolist threatens to neglect marginal consumers for the sake of a comparatively small saving in marketing costs.

Similarly, a monopolist’s willingness to pay to shift away from pooling and towards customization amounts to \( (v - m' + m + m)N \), which is less than type-A consumers’ resistance if \( (1 - \alpha)(1 - \gamma)v < m' - m \), i.e., if the value created through getting marginal consumers what they want is less than the added marketing cost of price discrimination. Sometimes, a monopolist will want to shift to customization for the sake of surplus appropriation, despite inefficiency. That is when privacy can create value and is chosen as equilibrium access allocation by the intermediary.

The precise conditions of an equilibrium access allocation featuring privacy, demonstrated in appendix, are as follows:

**Proposition 1** (Privacy or market coarsening in the monopoly case).

In the monopoly case, the equilibrium access allocation involves type-A consumers paying the intermediary to prevent usage of \( M' \) in the following cases:

1. \( \gamma > \alpha, v > m'_b \), and \( m' - m > \Delta > (1 - \alpha)(m' - m) \), where \( \Delta = (1 - \alpha)(1 - \gamma)v \) represents the value created by a shift from pooling to customization, and
2. \( \gamma > \alpha \) and \( (1 - \alpha)v > m - am'_A > (\gamma - \alpha)v \), where \( m - am'_A \) represents the cost saved by a shift from pooling to neglect.
4. COMPETITIVE CASE

In the previous section, the supplying firm was under no competitive pressure. This section assumes free market entry. Each potential entrant decides simultaneously on (1) what good(s) to offer to each consumer type, and (2) at what price(s). The product offering must be access-compatible in the sense that it must respect the constraints inherent to the available market access system. For instance, under access system $M$, firms can only decide to offer $A$ to all consumers, or $B$ to all consumers, or both goods to all consumers. All firms are identical in the baseline case involving $M$ only, but a profit-inducing inequality in access costs could result from the intermediary’s decision to allocate $M’$ to one firm in exclusivity.

Because of the strategic choice of an access-compatible product line and because of the possible asymmetry in market access, one cannot speak of Bertrand competition (which refers to price-based competition in a symmetric context). However, similar to Bertrand competition, the equilibrium concept adopted here is reached when no firm can profitably undercut the current prices.

The undercut-proof equilibrium is reached with a combination $(p_A, p_B)$ of prices and a combination of product offerings (product offer to type-$A$ consumers, product offer to type-$B$ consumers) such that no rival firm can make profitable and access-compatible offerings that would involve lower prices and attract all consumers of any type. A similar definition of undercut-proof equilibrium in a different context can be found in Shy (2001).

4.1. Equilibrium under Shared Access

When all firms are using the coarse consumer access system $M$, the undercut-proof equilibrium intuitively depends on the strength of type-$B$ consumers’ desire to get what they want (as opposed to consuming $A$), denoted by $\Delta = (1 - \alpha)(1 - \gamma) v N$.

**Lemma 3** (Competitive equilibrium under coarse access)

In the competitive case under coarse access system $M$, the only existing undercut-proof equilibria are

Pooling with $p = m$ if $\Delta \leq m$, and

Self-selection with $p_A = \frac{m}{\alpha}$ and $p_B = \frac{m}{1 - \alpha}$ if $\Delta > \alpha m$ and $(1 - \alpha)v \geq m$.

Two remarks are in order. First, a comparison between Lemmas 1 and 3 reveals that competition between suppliers makes pooling more likely. No neglect equilibrium can be supported (at least when $\gamma > 0.5$), and the condition for self-selection is more restrictive under competition (one can easily check that $(1 - \gamma)v > m$, as required for self-selection under Lemma 1 is less restrictive than $\Delta / \alpha > m$). Reminiscent of Schumpeter (1942), this model predicts that competition reduces the likelihood of variety, while it also reduces neglect of marginal consumers.

However, a second remark is that if $\alpha m < \Delta \leq m \leq (1 - \alpha)v$, variety can be supported as an undercut-proof equilibrium even though it adds less value than the additional cost involved in
marketing a second good. The reason for this inefficiency lies in the asymmetric flexibility between pooling and self-selection as weapons to undercut, with self-selection offering one more degree of freedom (two prices to set instead of one in the case of pooling). It is harder for a competitor to undercut with a pooling offer than with two separate self-selection offerings and, as a result, inefficient self-selection equilibrium can be sustained. In other words, coordination failure can lead competition to produce more variety than it should.

When all firms share usage of the finer consumer access system \( M' \) (a situation denoted by \( M'_s \)) the undercut-proof equilibrium imposes more restrictive conditions on pooling and less restrictive conditions on variety, as expected intuitively:

**Lemma 4** (Competitive equilibrium under shared finer access) If more than one competing firm uses finer access system \( M' \), the only existing undercut-proof equilibria are

- Pooling with \( p = m \) if \( \Delta \leq m' - m \), and
- Customization with \( p_A = m'_A \) and \( p_B = m'_B \) if \( \Delta \geq (1 - \alpha)(m'_B - m) \) and \( \nu \geq m'_B \)

Again, it appears that customization can be supported as an undercut-proof equilibrium even when it creates less value added than the implied additional marketing cost (when \( m' - m \geq \Delta \geq (1 - \alpha)(m'_B - m) \)). One purpose of this paper is to see whether the introduction of a market for \( M' \) can prevent an inefficient shift from pooling to customization.

### 4.2. Equilibrium under Exclusive Access

This section examines the outcome resulting from making finer market access (\( M' \)) available to one firm (called “the innovator”) while the other competing firms continue to use \( M \). This situation of exclusive appropriation can be denoted by \( M'_e \). The innovator’s competitive advantage comes from the ability to create variety at a lower cost, or to offer variety when the coarse access system leads competitors to favor pooling.

In order to successfully compete against self-selection, the innovator can simply match (in fact, slightly undercut) his competitors’ best prices and derive a profit thanks to access costs savings associated with \( M' \).

In order to compete against his competitors’ attempt to impose a pooling equilibrium, the innovator can use \( M' \) to economically channel good \( B \) to type-\( B \) consumers, who will be willing to pay a premium to get what they want and depart from pooling. Having attracted type-\( B \) consumers and thereby destroyed the other firms’ ability to implement pooling, the innovator then has an opportunity to charge good \( A \) at a premium as well. Obviously, returns to scale and consumer adaptability are two notable enemies of the innovator.
Lemma 5 (Competitive equilibrium under exclusive finer access)

If an innovator obtains finer access system $M'$ in exclusivity while other competitors use coarse access system $M$, then the innovator can profitably offer customization at the following undercut-proof prices:

\[
\begin{align*}
 p_A &= \frac{m}{\alpha} \quad \text{and} \quad p_B = \frac{m}{1-\alpha} \quad \text{if } \Delta \geq \alpha m \text{ and } (1-\alpha)v \geq m \\
 p_A &= \frac{m}{\alpha} \quad \text{and} \quad p_B = m + (1-\gamma)v \quad \text{if } \alpha m > \Delta > \max\left\{m'(2-\alpha)m, \frac{(1-\alpha)^2 m}{\alpha}\right\} \\
 p_A &= p_B = m + (1-\gamma)v \quad \text{if } (1-\alpha)(m'-m) \leq \Delta < \frac{(1-\alpha)^2 m}{\alpha} \\
\end{align*}
\]

Otherwise (if $\Delta$ is too small), the innovator can’t use $M'$ profitably.

The last price combination (which constrains the ability of the innovator to increase the price of good $A$) occurs when adaptability is high and returns to scale are not too high, limiting the innovator’s advantage ($\gamma > \frac{3\alpha - 1}{2\alpha}$ and $m' < \frac{m}{\alpha}$).

A comparison between Lemma 5 and Lemma 4 reveals that $M'_{e}$ increases the possibility of customization as compared to $M'_{s}$, if returns to scale in marketing are not too strong. This reinforces the earlier finding that monopolistic power is a source of product variety.

4.3. Privacy Equilibrium

The key characteristic of finer access system $M'$ is that it makes variety cheaper to offer. A privacy equilibrium will occur (1) if some agent wants $M'$ to be used even though it creates inefficient variety, in an instance where (2) a shift to $M'$ would hurt another agent who would then be willing to bid against $M'$ and impose privacy.

Lemmas 4 and 5 reveal that marginal (type-B) consumers never suffer from a shift to finer access, whatever its mode of allocation. Similarly, firms are indifferent to finer access unless they can become an innovator and enjoy a positive profit. Thus, privacy equilibrium can only emerge from a desire of mainstream consumers to protect their surplus. Note that if self-selection reigns under $M$, a shift to $M'$ is either improving type-$A$ consumers’ surplus, or leaving it unchanged. Thus, similar to the monopoly context, privacy emerges from an attempt of mainstream consumers to maintain pooling. De facto, it corresponds to mainstream’s willingness to subsidize type-$B$ consumers to help them adapt to mainstream tastes. For privacy to become the equilibrium access allocation, type-$A$’s prospective surplus loss from a shift away from pooling must be larger than an innovator’s incentive towards $M'_{e}$, and larger than the type-$B$ consumers’ incentive towards $M'_{s}$. As expressed in Proposition 2, privacy will result whenever there is an inefficient drive on behalf of firms towards customization:
**Proposition 2** (Privacy or market coarsening in the competitive case).

In the competitive case, the equilibrium access allocation involves type-A consumers paying the intermediary to prevent usage of \( M' \) if and only if pooling occurs in the baseline situation under \( M \) and

\[
\max\{m'-(2-\alpha)m,(1-\alpha)(m'-m)\} \leq \Delta < m'-m.
\]

It is interesting to compare Proposition 2 with Proposition 1. First, a monopolist’s drive in favor of a shift to neglect (“customer selection”) causes more instances of privacy contracts in the monopoly context. Second, customization is a little less attractive for an innovator than it is for a monopolist because, despite their competitive disadvantage in case of exclusive finer access, competition prevents full extraction of value. This makes the condition in Proposition 2 a bit more restrictive than in Proposition 1 (condition (1)). Thus in total, it can be said that competition among firms reduces privacy concerns (and the likelihood of privacy contracts). In other words, mainstream consumers have an easier time imposing their tastes on marginal consumers when there is broad competition on the supply side.

One could venture an explanation for the practice of “everyday low pricing” in the fact that intermediaries don’t need to subsidize their marginal patrons when consumers are more homogenous, competition is more intense on the supply side and returns to scale are larger.

### 4.4. Exposure Equilibrium

Who gains most from exposure and when?

Starting from self-selection under \( M \), the additional profit from customization gained by an exclusive owner of finer access is equal to the sum of the surplus that consumers would get from a shift to shared finer access. Thus an innovator will be awarded exclusive access in that case.

Starting from pooling under \( M \), ruling out privacy cases, customization (given \( \Delta \geq m'-m \)) would occur in both modes of exposure. Again, the force in favor of exclusive finer access is greater than any consumer type’s individual drive in favor of shared access.

**Proposition 3** (Exposure in the competitive case).

In the competitive case, the equilibrium access allocation involves a firm paying the intermediary to acquire exclusive usage of \( M' \) in all cases where \( \Delta > m'-m \).

The condition in proposition 3 reveals that consumer heterogeneity, low adaptability, and high involvement should lead intermediaries to negotiate exclusive finer access, allowing them to capture (through competition among potential innovators) some of the surplus lost by mainstream consumers, at the same time that marginal consumers get more of what they want most.
5. **CONCLUSION**

This paper has explored the implications of recognizing that different agents have different preferences about how coarse or fine a marketing system firms should use to approach consumers. Mainstream consumers obtain a surplus when firms rely on a coarse access system. Marginal consumers, in contrast, benefit from firms competing within the framework of a finer access system. Firms can gain a competitive advantage by obtaining the finer access system in exclusivity and extracting consumer surplus by treating different consumers differently.

Firms have an incentive to use finer segmentations and to make customized offers even when the implied additional marketing costs (due to returns to scale in marketing) are larger than the value created for consumers through product customization. When such is the case, an intermediary can profitably supply market coarsening, sharing the consumer surplus it helps to restore. These findings highlight the limits of assuming that profit-driven firms are in charge of commanding segmentation and price discrimination processes in their best interest, as commonly taught to students of marketing. Analysis also found that when the drive for consumer exposure dominates privacy concerns, finer access should always be negotiated in exclusivity with one firm.

It maybe worthwhile to conclude with a list of testable implications:

- Privacy concerns are expressed by mainstream consumers, not by marginal or underserved consumers.

- Privacy concerns arise only when consumer information would cause firms (1) to drop service to marginal consumers or (2) to increase variety through customized offers. There is no demand for privacy when consumer information is merely used by firms to shift from self-selection (where variety is offered to all) to customization (where variety is channeled in a more targeted fashion), without an impact on the amount of variety offered.

- Privacy equilibria (whereby intermediaries conceal the actual variety of their customer base) are more likely to occur when supplying firms face less competition, when there are larger returns to scale in marketing, when consumers have more homogenous preferences, and when consumers are more adaptable and less involved. The opposite circumstances favor the equilibrium appearance of finer segmentations and discrimination opportunities.

- Privacy equilibria require the intermediary to compensate marginal consumers in order to keep them from sticking out of the crowd (assuming that marginal consumers could coordinate to sell their type).
6. **APPENDIX**

Proof of Lemma 2

Profit is \( \alpha (v - m_A')N \) in case of neglect, \( (v - m)N \) in case of pooling, and \( (v - m')N \) in case of customization. Neglect dominates customization if and only if \( \alpha v - \alpha m_A' > v - m' \), i.e., \( m' - \alpha m_A' > (1 - \alpha)v \), equivalent to \( m_B' > v \). Neglect dominates pooling if

\[
(\gamma - \alpha)v < m - \alpha m_A' \quad (>0)\]

which always holds if \( \alpha \geq \gamma \) or if \( \alpha < \gamma \) and \( v < \frac{m - m_A'}{\gamma - \alpha} \). One can easily check that \( m_B' > \frac{m - m_A'}{\gamma - \alpha} \). Customization dominates neglect if \( m_B' \leq v \) and it also dominates pooling if \( m' - m < (1 - \gamma)v \). The sign of \( \alpha - \gamma \) determines which constraint is more restrictive. Note that \( m_B' > \frac{m - m}{1 - \gamma} \) if \( (1 - \gamma)m_B' > \alpha m_A' + (1 - \alpha)m_B' - m \), i.e.,

\[
(\alpha - \gamma)m_B' > \alpha m_A' - m. \]

As \( \alpha m_A' - m \leq 0 \), \( \alpha \geq \gamma \) implies \( m_B' > \frac{m - m}{1 - \gamma} \).

Proof of Proposition 1

Privacy occurs in two sets of circumstances. The first set of circumstances involves pooling under \( M \), i.e., \( \gamma > \alpha \) and \( m > (1 - \gamma)v \), combined with self-selection under \( M' \), i.e., \( v < \frac{m - \alpha m_A'}{\gamma - \alpha} \), and an inefficient shift away from pooling towards neglect, i.e., \( (1 - \alpha)v > m - \alpha m_A' \). Taken together, these conditions require \( \gamma > \alpha \) and \( \frac{m}{1 - \gamma} > \frac{m - \alpha m_A'}{\gamma - \alpha} > v > \frac{m - \alpha m_A'}{\gamma - \alpha} \). The second set of circumstances involves pooling under \( M \) combined with customization under \( M' \), i.e., \( v > \max \left\{ \frac{m - m}{1 - \gamma}, m_B' \right\} \), and an inefficient shift away from pooling towards customization, i.e. \( v < \frac{m - m}{(1 - \alpha)(1 - \gamma)} \). Taken together, these conditions require \( \gamma > \alpha \), \( v > m_B' \)

and \( \frac{m - m}{(1 - \alpha)(1 - \gamma)} > v > \frac{m - m}{1 - \gamma} \).

Proof of Lemma 3

First, **there exists no neglect equilibrium.** A firm offering \( A \) only will be undercut until \( p_A = \frac{m}{\alpha} \) by other firms offering \( A \) only. This price can be undercut through pooling with \( p_A = m + \varepsilon \leq \frac{m}{\alpha} \).
if \( \gamma - m - \varepsilon > 0 \) (profitability) and \( \varepsilon \geq 0 \). This is always possible given that \( m / \nu \leq 1 / 2 \) and \( \gamma \geq 1 / 2 \).

Second, under what conditions does a pooling equilibrium exist? A firm that offers good A only to both type-A and type-B consumers can be undercut through pooling until \( p_A = m \) (zero-profit condition). Pooling at price \( p_A = m \) can be undercut through self-selection with \( p_A = m \) and \( p_B \) such that \( v - p_B > \gamma - m \). Price \( p_B = v(1 - \gamma) + m - \varepsilon \) (\( \varepsilon \geq 0 \)) make such undercutting profitable only if \( \alpha m + (1 - \alpha)(1 - \gamma)v + (1 - \alpha)m - 2m = (1 - \alpha)(1 - \gamma)v - m > 0 \). Thus pooling at price \( p_A = m \) is undercut-proof if \( (1 - \alpha)(1 - \gamma)v \leq m \).

Third, under what conditions does a self-selection equilibrium exist? A self-selection equilibrium will require \( p_A \) and \( p_B \) to obey the following constraints:

(i) \( \alpha p_A + (1 - \alpha)p_B - 2m = 0 \) (zero-profit condition),
(ii) \( p_A \leq \frac{m}{1 - \alpha} \) (impossibility to undercut through a single-product offering of A),
(iii) \( p_B \leq \frac{m}{1 - \alpha} \) (impossibility to undercut through a single-product offering of B),
(iv) \( v - p_A > \gamma - p_B \) (type-A consumers select good A),
(v) \( v - p_B > \gamma - p_A \) (type-B consumers select good B),
(vi) \( \min\{p_A, p_A - (1 - \gamma)v\} < m \) (impossibility to undercut through pooling with good A).
(vii) \( \min\{p_B, p_A - (1 - \gamma)v\} < m \) (impossibility to undercut through pooling with good B).

If \( p_A < \frac{m}{\alpha} \), then (i) implies that \( p_B > \frac{m}{1 - \alpha} \), which is ruled out by (iii). Thus, by (ii), \( p_A = \frac{m}{\alpha} \).

Then, by (i), \( p_B = \frac{m}{1 - \alpha} \). Constraint (iv) is always fulfilled. Constraint (v) requires

\[
\frac{2\alpha - 1}{\alpha} m < \Delta.
\]

Constraint (iv) implies that constraint (vi) writes \( \frac{m}{1 - \alpha} - (1 - \gamma)v < m \), which is equivalent to the stricter constraint \( \alpha m < \Delta \). Constraint (v) implies that constraint (vii) writes \( \frac{m}{\alpha} - (1 - \gamma)v < m \), which is equivalent to \( (1 - \alpha)m < \alpha(1 - \gamma)v \). A straightforward comparison shows that if \( \alpha > 1 / 2 \) then \( \alpha m < \Delta \) is more restrictive than \( (1 - \alpha)m < \alpha(1 - \gamma)v \).

Proof of Lemma 4

An undercut-proof customization equilibrium obeys the following set of constraints:

(i) \( \alpha p_A + (1 - \alpha)p_B - m' = 0 \) (zero-profit condition),
(ii) \( p_A \leq m_A' \) (impossibility to undercut through a single-product offering of A),
(iii) \( p_B \leq m_B' \) (impossibility to undercut through a single-product offering of B),
(iv) \( \min\{p_A, p_B - (1 - \gamma)v\} \leq m \) (impossibility to undercut through pooling with good A),
(v) \( \min\{p_B, p_A - (1 - \gamma)v\} \leq m \) (impossibility to undercut through pooling with good B).
Unlike in the case of Lemma 3, there is no self-selection constraint. (i) to (iii) imply that
\[ p_A = m_A' \quad \text{and} \quad p_B = m_B'. \]
As neither \( p_A \) nor \( p_B \) is less than \( m \), (iv) requires \( m_B' - (1 - \gamma)v \leq m \),
equivalent to \( \Delta \geq (1 - \alpha)(m_B' - m) \), and (v) requires \( m_A' - (1 - \gamma)v \leq m \), equivalent to
\[ \Delta \geq (1 - \alpha)(m_A' - m) \] (a less restrictive constraint).

A pooling equilibrium will require \( p = m \) and \( \alpha m + (1 - \alpha)m + \Delta - m' \leq 0 \) (no possibility of
profitable undercut through customization), implying \( \Delta \leq m' - m \).

Proof of Lemma 5

Due to the presence of returns to scale, a finer access system does not give any advantage to the
innovator who would compete through pooling. However, customization by the innovator can yield positive profit, under the following set of constraints:

(i) \( \alpha p_A + (1 - \alpha)p_B - m' \geq 0 \)
(ii) \( p_A \leq \frac{m}{\alpha} \) (impossibility for non-innovators to undercut through a single-product offering of

\( A \)),
(iii) \( p_B \leq \frac{m}{1 - \alpha} \) (impossibility to undercut through a single-product offering of \( B \)),
(iv) \( \min\{p_A, p_B - (1 - \gamma)v\} \leq m \),
(v) \( \min\{p_B, p_A - (1 - \gamma)v\} \leq m \).

Constraints (ii) to (v) point to the following profit maximizing prices:

\[
\begin{align*}
&\begin{cases}
    p_A = \frac{m}{\alpha} \text{ and } p_B = \frac{m}{1 - \alpha} \quad \text{if} \quad \frac{m}{1 - \alpha} \leq m + (1 - \gamma)v \\
    p_A = \frac{m}{\alpha} \text{ and } p_B = m + (1 - \gamma)v \quad \text{if} \quad \frac{m}{1 - \alpha} < m + (1 - \gamma)v < \frac{m}{1 - \alpha} \\
    p_A = p_B = m + (1 - \gamma)v \quad \text{if} \quad m + (1 - \gamma)v \leq \frac{m}{\alpha}
\end{cases}
\end{align*}
\]

These prices and accompanying conditions have to be checked for existence and profitability.

First, \( m + (1 - \gamma)v \geq \frac{m}{1 - \alpha} \) can occur if \( \Delta \geq \alpha m \). One can check that if \( \alpha > 1/2 \) and \( \gamma > 1/2 \),
\( \alpha m > (1 - \alpha)(1 - \gamma)2m \) (the lower bound on \( \Delta \)). Thus \( \Delta \geq \alpha m \) is the required existence condition
for the first set of prices. Profitability is clear at these prices, as \( m' < 2m \).
Second, \( \frac{m}{\alpha} < m + (1 - \gamma) v < \frac{m}{1 - \alpha} \) is equivalent to \( \frac{(1 - \alpha)^2 m}{\alpha} < \Delta < \alpha m \). Profitability with the second set of prices requires \( m + (1 - \alpha) m + \Delta - m' \geq 0 \), i.e., \( \Delta \geq m' - (2 - \alpha) m \). Note that
\[
\frac{(1 - \alpha)^2 m}{\alpha} > m' - (2 - \alpha) m \text{ if } \frac{m}{\alpha} > m'.
\]

Accounting for profitability, the third set of prices requires
\[
\max \left\{ (1 - \alpha)(1 - \gamma) 2m, (1 - \alpha)(m' - m) \right\} < \Delta \leq \frac{(1 - \alpha)^2 m}{\alpha}. \]
For such a \( \Delta \) to exist, one needs both
\[
\gamma > \frac{3\alpha - 1}{2\alpha} \text{ and } m' < \frac{m}{\alpha}.
\]

Proof of Proposition 2

As noted in the text, type-A consumers are the only agent interested in maintaining coarse access, provided the baseline situation involves pooling. First, consider the condition under which an access allocation contract involving privacy can dominate an access contract involving shared finer access. Type-B consumers, through exposure, look forward to a gain equal to
\[
(1 - \alpha)(v - m_B' - \gamma v + m) = \Delta - (1 - \alpha)(m_B' - m). \]
Type-A consumers by discouraging exposure would gain \( \alpha (v - m - v + m_A') = \alpha(m_A' - m) > 0 \). Thus, a necessary condition for privacy to dominate is \( \alpha(m_A' - m) > \Delta - (1 - \alpha)(m_B' - m) > 0 \), i.e., \( m' - m > \Delta \). Second, consider the conditions under which privacy can dominate an access contract involving exclusive access.

Based on Lemma 5, if \( m' - m > \Delta \geq \alpha m \), then the gain of discouraging exposure for type-A consumers is
\[
\alpha \left( \frac{m}{\alpha} - m \right) \right) N, \text{ which is greater than profit } (2m - m') N \text{ if } m' - m > \alpha m, \text{ which must be true (in a case with } m' - m > \Delta \geq \alpha m \text{). Next, if } \Delta < \alpha m, \text{ profit from exclusive access goes down while the incentive to protect surplus remains the same. In the conditions under which } p_0 = m + (1 - \gamma) v, \text{ profit is } (m + (1 - \gamma) v - m') N \text{ and the benefit from privacy for type-A consumers is } \alpha(1 - \gamma) v N, \text{ leading to privacy condition } m' - m > \Delta \text{ again, which therefore appears to be both necessary and sufficient.}

Proof of Proposition 3

First, examine the case where self-selection emerges under \( M \). Following Lemma 5, \( M' \) will lead to customization without change in price, yielding innovator profit \( 2m - m' \). Observe that
\[
\alpha \left( \frac{m}{\alpha} - m_A^e \right) < 2m - m' \text{ and } (1 - \alpha) \left( \frac{m}{1 - \alpha} - m_B^e \right) < 2m - m', \text{ i.e., no access allocation contract involving either type-A consumers or type-B consumers can dominate an exclusivity contract with an innovator.}
\]

Second, examine the case where pooling emerges under \( M \). Accounting for proposition 2, this means focusing on cases with \( m' - m \leq \Delta \leq m \). As \( (1 - \alpha)(m_B' - m) < m' - m \), Lemma 4 implies that
there will be customization under shared finer access (assuming \( v > m'_B \)). Similarly, as \((1 - \alpha)(m' - m) < m' - m\), Lemma 5 implies that the same real outcome (marketing costs and value created) will emerge from exclusive finer access. Consequently, for a consumer type to be able to propose a dominating access allocation contract involving shared finer access, it must be that the other type gains more surplus under exclusive finer access than under shared finer access (so that the proposed allocation captures both the innovator’s profit and some of the other consumer type’s surplus). However, one can check that if \( \Delta \geq m' - m \) all the prices of good \( B \) involved in Lemma 5 are greater than \( m'_B \), and all the prices of good \( A \) involved in the same lemma are greater than \( m'_A \). Thus the profit involved in \( M'_c \) is larger than any surplus a consumer type could gain by inducing \( M'_s \) instead of \( M'_c \).
7. REFERENCES


