Lecture 6: Asymmetric Information [1]

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[1] The lecture is based on [Belleflamme and Peitz, 2015] Chapter 12(Asymmetric information, prices and advertising signals) and Chapter 13(Warranties and Branding). We focus on the models introduced in Chapter 12 while discuss some concept in Chapter 13.

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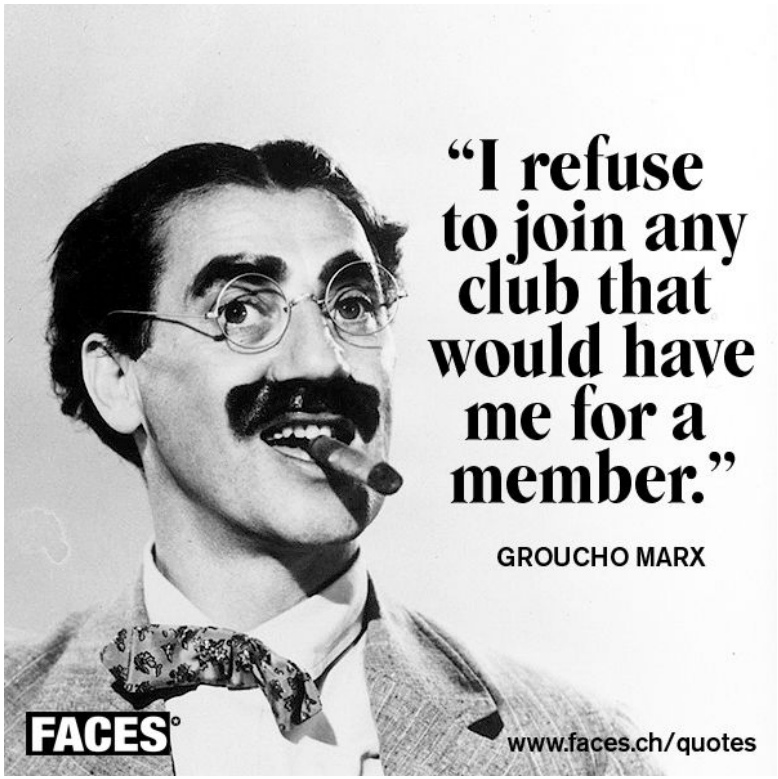
  - convince consumers that the new product satisfies their wants.
  - main challenge is that consumers do not observe quality.

Asymmetric Information

Firms have to convince consumers that their products are of high quality using a variety of marketing instruments.
Questions:

- Basic questions about the asymmetric information?
  - What is the adverse selection problem?
  - What is Moral Hazard?
- How does firms choose the marketing tools to cope with the asymmetric information problem?
  - What strategies will firms employ to convice consumers about the quality of its product? e.g. advertising, pricing.
  - What other strategies beyond pricing and advertising can firms employ? e.g. umbrella branding, branding over time, warranty.

Adverse selection in a nutshell I



https://www.youtube.com/watch?v=sXPXpJ5vMnU
https://www.youtube.com/watch?v=pUkRo9COd38

Adverse selection in a nutshell II

Questions:

1. In a used car market with "lemons" and "plums", if the consumer cannot tell a "lemon" from a "plum", how would he make an offer?
2. How will a seller who sells "plums" respond? What is the eventual outcome of the market?
3. What are some measures to ensure the market is functioning?

Adverse Selection I

Hidden information problem

- Suppose that a single seller offers a product of two potential levels of quality $s \in \{L, H\}$.
- Supply side seller's cost $c_s : c_L < c_H$.
- Demand side, identical and unit mass of buyers with reserved value $r_s : r_L < r_H$.
- Probability λ seller is high type. Expected utility for a buyer is $\lambda r_H + (1 - \lambda) r_L$.

Case

Why did prices plunge on the Mumbai second-hand car market after July 2005?

- On 26 July 2005, Mumbai was struck by a great deluge. For the next couple of days, tens of thousands of cars were stranded in the rain, many of them being submerged in water. These cars were later towed to the nearest service centre for reparation.

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- However, consumers were aware that water damages were likely to have long-lasting consequences and that additional use might, in the future, aggravate the internal damage that was currently unobservable (e.g., water might have entered the engine or any other part, and got mixed with the fuel; similarly, if seats and covers had simply been machine dried, they could start smelling after some time).

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- Therefore, consumers rationally factored these likely additional future expenses into their costs. In other words, they revised their expectation of quality downward, which explains why the second-hand market for cars dropped by at least 15%.

Adverse Selection I

To formally analyse asymmetric information problems, we consider the following three-stage game:

- at the first stage, nature draws the seller's product quality from some known distribution and its realization is observed by the seller but not by buyers;
- at the second stage, the seller decides whether and which price to post;
- at the third stage, consumers form beliefs about the firm's product quality and make their purchasing decision.

Equilibrium Pricing

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- If $c_H < r_L$, firms pick the same price independent of quality.

Conclusion

Adverse Selection

In markets in which product quality is exogenous but unobservable, high-quality products may not be offered for sale.

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  - In the case of two qualities, a high-quality producer has an incentive to reveal its quality to consumers,
  - A low-quality producer would like to keep this information private.
- Because consumers know that a high-quality producer always provides information, they correctly anticipate that a product whose quality has not been revealed must be of low quality.

Case

Selling used products on eBay

Information asymmetries are particularly pronounced for used products such as used cars. Some sellers have addressed these problems by offering warranties for used cars; others allow for detailed inspections. Perhaps more surprising is that eBay has proved to be a successful platform to sell used cars.

One explanation for its success is that it allows sellers to disclose information. As has been tested empirically, this voluntary information disclosure reduces the information asymmetry in the market. Obtaining information on voluntary information disclosure in a large dataset is not trivial. However, some standardized checks can provide proxies for the degree of information disclosure, for instance, the number of bytes used to reveal information, the number of photos included, and text search for particular words such as ”rust” and ”no rust”.

This provides information on top of the information that has to be provided. It can then be checked that these various information measures have a positive effect on price. However, if consumers are willing to pay more, this must mean that they obtain better cars. We can therefore infer that information about features that are valuable to buyers is more likely to be disclosed by sellers.

Moral hazard in a nutshell I

https://www.youtube.com/watch?v=5v7TWKlYoN0
https://www.youtube.com/watch?v=6faL76QZ2AA
Questions:

1. What are the risks of the car owner if he chooses to repair a car and the mechanics has more information about the car repairing?
2. What are other examples of moral hazard? Describe 2 examples.
3. Name two solutions to moral hazard.

Moral Hazard I

- Our analysis of asymmetric information so far has been restricted to hidden information.
- If the realization of quality is not an exogenous event but is instead controlled by the firm, we speak of a situation of hidden action.
- In such a framework, we describe first how hidden action generates a moral hazard problem.
- We ask then whether the problem still holds if firms have the possibility to make a risky investment in quality and if the investment level but not the outcome can be observed by the consumers.

Model I

To formally analyse asymmetric information problems, we consider the following three-stage game:

- at the first stage, the firm itself that chooses its quality. The realization is observed by the seller but not by buyers;
- at the second stage, the seller decides whether and which price to post;
- at the third stage, consumers form beliefs about the firm's product quality and make their purchasing decision.

Equilibrium Pricing

Under full information, first best allocation the firm fully extracts all surplus.

- the firm chooses high quality if it yields a larger margin, i.e., if $r_H - c_H > r_L - c_L$;
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If the quality choice is a hidden action.

- The low-quality firm can always mimic the behaviour of the high-quality firm at stage 2.
- Therefore, the high-quality firm cannot at the same time derive profits above $r_L - c_H$ and separate itself from a low-quality firm.
- moral hazard problem: in the unique equilibrium of the game, the firm produces low quality.

Conclusion

Moral Hazard

In markets in which firms choose quality, firms tend to provide too low quality from a social point of view.

Risky investments in quality I

Whether a risky investment in quality (where the investment is observable to consumers) results in the same type of quality trap as above?

Benchmark Model

- he probability that the product is of high quality is denoted by λ. A higher probability λ requires a larger investment $I(\lambda)$. Suppose $I' > 0$ and $I'' > 0$. In particular $I(\lambda) = \frac{k}{2}\lambda^2$.
- Under full information, the firm's maximization problem is $max_\lambda \lambda(r_H - c_H) + (1-\lambda)(r_L - c_L) - (k/2)\lambda^2$. Solving the first order condition, ew obtain the probability for high quality is $\lambda^f \equiv [(r_H - c_H) - (r_L - c_L)]/k$

Risky investments in quality II

Model with adverse selection

- Consider now the situation in which consumers observe the firm's investment I but not the realization of quality. We start with the situation where consumers expect both qualities to be put on the market.
- Then the expected utility is $\lambda r_H + (1-\lambda) r_L$, which is the price the firm will set at stage 2. Hence, expected profits at stage 1 are

$$\begin{aligned}&\lambda[\lambda r_H + (1-\lambda) r_L - c_H] + (1-\lambda)[\lambda r_H + (1-\lambda) r_L - c_L] - (k/2)\lambda^2 \\ &= \lambda(r_H - c_H) + (1-\lambda)(r_L - c_L) - (k/2)\lambda^2.\end{aligned}$$

Risky investments in quality III

- Hence, the objective function of the firm is the same as under full information and the solution to this problem, denoted by λ^a is equal to λ^f.

Risky investments in quality IV

Model with Moral Hazard

- However, at stage 2, the firm may not be interested in offering high quality on the market, while it is always willing to do so under full information, if $r_H - c_H > 0 > \lambda r_H + (1-\lambda) r_L - c_H$ (a necessary condition for the latter inequalities to hold is that $r_L < c_H$.
- $I(\lambda^a)$ is not the profit-maximizing investment.
- Girm may want to invest more so that at stage 2, it is committed to stay also with the high-cost (high-quality) product.
- For this, it has to invest at least $I(\tilde{\lambda})$, where $\tilde{\lambda} = (c_H - r_L)/(r_H - r_L) > \lambda^a$.

Risky investments in quality V

- the adverse selection effect that makes the full-information investment level unsustainable may lead to overinvestment compared to full information.

Conclusion

Risky investments

If consumers observe investments in the reliability of products but not reliability itself, a firm may actually invest more in reliability (or quality) under asymmetric information than under full information.

To summarize, we should not conclude that asymmetric information about product quality automatically reduces the incentives to provide higher quality; the reverse may actually be true.

Case I

Quality management systems

The type of investment we have in mind can be exemplified by a firm's effort to meet standards for quality management systems, such as ISO 9000. The ISO 9000 certification does not guarantee the quality of end products and services; rather, it certifies that consistent business processes are being applied. That is, it proves that the firm (actually, any type of organization) has put in place the necessary processes (i.e., a quality management system) "to fulfil the customer's quality requirements, and applicable regulatory requirements, while aiming to enhance customer satisfaction, and achieve continual improvement of its performance in pursuit of these objectives" (taken from www.iso.org).

Case II

[Cole, 1998](p. 68) confirms this view by suggesting that firms may make ISO 9000 "their primary instrument for signaling quality to their customers". However, firms may also seek certification simply in compliance with requirements of major customers or regulators.

To disentangle the relative importance of these two motivations, [Anderson et al., 1999] estimate a probit model of ISO 9000 certification. They show that the signalling motivation is indeed important: the desirability of communicating quality outcomes to external parties provides incremental explanatory power for the certification decision (even after including compliance motivations for seeking certification). Quality management systems seem thus to correspond to the type of investments we refer to in this section.

Signalling Devices I

Channels a signalling device can work:

- Repeat purchases
- Cost differences
- Information differences
- Warranties

Repeated Purchases I

- In markets for experience goods, observe firms spending large amounts of resources on advertising and other marketing activities.
- We may then want to know whether a firm can use other strategies such as advertising or distorted prices to signal the quality of its product.

Repeated Purchases II

With repeated purchases, the signalling works as follow:

- To an uninformed consumer, a high-quality firm does not have a credible and profitable signalling strategy.
- If the firm can also sell (at some later point) to consumers who have become informed about product quality, it may have an incentive to spend resources as a signal of product quality.
- A low-quality firm would be discovered at some point, thus losing its sales.

Conclusion

Advertising as signals for quality

Advertising and other strategies in which a firm publicly "burns money" can be a credible means for a firm to communicate to consumers that it is of high quality. In particular, such a strategy can be successful if a repeat purchase effect is present.

Model with Repeated Purchase I

- The utility of $r_H > r_L$.
- The unit costs are the same, $c_L = c_H = c$ and that all consumers face the same asymmetric information problem. [2]

Model with Repeated Purchase II

Timing

- First, the firm learns its type but consumers do not. Then, the firm sets its first-period price and it possibly takes some action that can be publicly observed by consumers but that does not directly affect demand.
- To fix ideas, we assume that the firm spends some amount of resources on advertising; the action is thus to choose some advertising expenditure and we denote this variable by A.
- After observing first-period price and advertising, consumers decide whether to buy.

Model with Repeated Purchase III

- If a consumer buys (and consumes the product), it observes the product quality.
- In the second period, the firm sets its second-period price and afterwards consumers buy. Since advertising expenditures cannot be rational in the second period, we only need to consider advertising in the first period.

[2] To make clear that our result in this subsection only relies on the repeat purchase effect, and relies neither on differences in costs nor on some consumers being informed.

Low price as signal

- Consumers may base their beliefs on price and the firm may alternatively set a price below marginal costs to signal high quality.
- Consider the case that firms cannot advertise but in which the price may contain information about product quality.
- Note that any price below c would lead to losses for a low-quality firm. Thus consumers may hold beliefs that any price below c must come from a high-quality firm.
- A firm that sets a price below marginal costs can thus signal that it is of high quality.[3]

[3] For further reading, see Section 12.2.2 in [Belleflamme and Peitz, 2015].

Conclusion

Low price as signal

A price below marginal costs can be a credible strategy for a firm to communicate to consumers that it is of high quality because it allows the firm to benefit from repeat purchases.

Case I

Empirical examination of advertising as a signal of quality

Although the signalling role of advertising has received a lot of attention in the theoretical literature, there are relatively few studies of its empirical relevance. This lack of systematic empirical studies has certainly to do with the difficulty of collecting comprehensive data sets containing various types of product characteristics along with producer and consumer information. Moreover, as explained by [Horstmann and MacDonald, 2003], the following data and methodology problems have to be addressed when testing the signalling role of advertising. First, a common strategy to test the signalling hypothesis consists in finding the positive correlations among quality, advertising and price predicted by the theoretical models. To do so, one must quantify the notion of quality that is appropriate for the signalling model; that is, one needs to find product information that is relevant to consumers but is available only to the firm. Common measures based on previous consumer experience, on observable product characteristics or including an

Case II

assessment of ”value for money”, do not meet this requirement; neither do publicly available quality indices.

A second problem occurs when the data contain a mix of new and established products. In that case, one needs to account for consumer experience with the product in order to build a correct test of the signalling hypothesis. Third, the use of cross-section data including significant product and/or firm heterogeneity makes the interpretation of correlation coefficients unclear if one fails to control adequately for this heterogeneity. Given these difficulties, it does not really come as a surprise that the results of the existing empirical studies are quite inconclusive, although they seem to be somewhat supportive of the signalling hypothesis.

Price Signals I

Prices as signals for quality

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Case

When low quality poses as high quality Bangladesh was hit with devastating floods in July and August 2007. In his description of the aftermath of the flood, Maswood Alam Khan (General Manager of the Bangladesh Krishi Bank) writes the following (emphasis added): "Millions of people in 38 of 64 districts of our country are passing hellish moments; thousands are afflicted with diseases like diarrhoea, typhoid, pneumonia, jaundice and skin infections. Refugees may fall sick with malaria, dengue fever and other fatal diseases.... The weak women and children are losing out to the adult and strong men in their fight to grab whatever miniscule relief materials are trickling down to relief camps. In addition, unscrupulous businesspersons are selling adulterated medicines at higher than normal prices lest buyers should doubt the genuineness of medicines, if offered at lower prices." ('Facing aftermath of the flood', The Independent, Bangladesh, August 2007).

Warranties I

- Firms may use warranties as a signal to consumers that their product is relatively reliable.
- Warranties and return policies can provide incentives to firms to invest in product reliability when the firm's investment decision cannot be observed by consumers.
- If the firm and consumers are subject to a moral hazard problem, the firm only provides partial compensation for a faulty product.

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