Two-sided Certification

The Market for Rating Agencies

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Research Question & Motivation

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  To which side of the market would an honest certifier offer his service - to Seller-Side, to Buyer-Side or to both Sides?
- Relevance:
  - Asymmetric distribution of information, e.g. in financial markets
  - Role of rating agencies in the current financial crisis
  - Regulation of the business model of rating agencies required?
- Certification industry more general:
  - TüV
  - Stiftung Warentest
  - Food labels (Öko-test, Bio-Siegel, etc.)

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Ratings and Rating markets

- What is a rating?
  - Definition: "Ratings are summary measures of assessment over the probability that a borrower will default." (Fitch, 2002)
  - Different default probabilities are grouped into rating classes: e.g. Moody's: Aaa to C
  - Players: combined market share of Moody's and S&P: 80 %
- How to construct a rating?
  - Private information of firms is accumulated and announced
  - Public information is accumulated and condensed
- Why do ratings exist?
  - Information asymmetries between market participants
  - Reduction of risk premia and volatility
  - Ease of risk sharing
- Who pays for the rating?
  - Before 1970: primarily paid by investors - private information
  - Thereafter: mainly paid by firms - public information

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Related Literature

- Biglaiser, G., 1993, ”Middlemen as Experts”, *RAND Journal of Economics* 24, 212-223
- Lizzeri, A., 1999, ”Information Revelation and Certification Intermediaries”, *RAND Journal of Economics* 30, 214-231
- Strausz, R., 2005, ”Honest certification and the threat of capture”, *International Journal of Industrial Organization* 23, 45-62
- Stahl, K., R. Strausz, 2009, ”Certification and Exchange in Vertically Concentrated Markets”, *work in progress*

Results from our Model

- A certifier can reduce welfare losses due to asymmetric information (Lemon Markets).
- A certifier can even make profits in efficient markets which would work without the certification service.
- If the certifier is solely able to sell to one side of the market he will offer his service to sellers.
- Independent of market type a profit maximizing certifier will sell to both sides of the market.
- In a Lemon Market two-sided certification increases welfare.
- In case of two-sided certification the bigger share (about 80%) of the certifier's revenues are generated by selling on seller side.

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The Model - Players and Objectives

The model includes 4 players of 3 different kinds:

- The certifier
  Objective: Maximize profits by selling her certification service to a seller and/or the buyers.
- One seller
  Objective: Maximize profits by selling her product at a high price (above her reservation utility) to one of the buyers
- Two buyers
  Objective: Maximize utility by buying the product below own willingness to pay

The Model: Parameters & Variables

- Assumption: The quality of a product q is distributed according to the uniform distribution on the interval [0,1].
- Quality q is private information on seller's side and is not credibly communicable.
- The buyers' willingness to pay for a product of quality q is q and the reservation utility of the seller is $\alpha q, \alpha \in [0, 1]$.
- Quality q can be certified by an intermediary for a certain price; the quality is announced truthfully; the certifier is able to discriminate between sellers and buyers.

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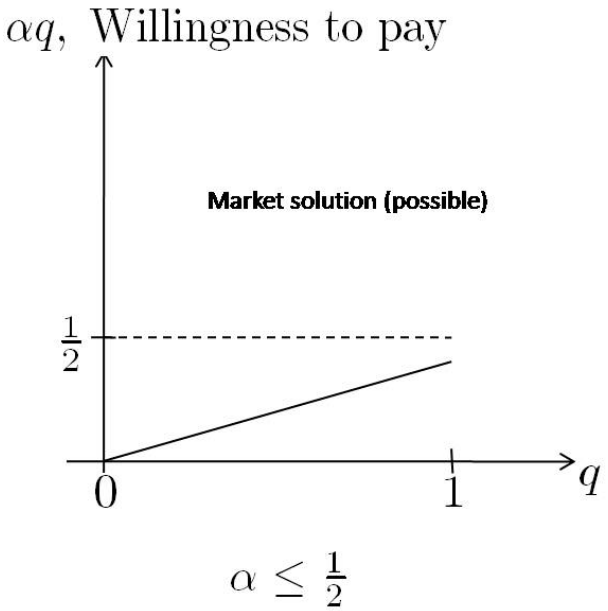
Market structure depending on parameter α

Depending on parameter α two fundamentally different kinds of markets appear.

- For values $\alpha > \frac{1}{2}$ we get a Lemon market in the sense of Akerlof(1970).
- For $\alpha \leq \frac{1}{2}$ the market clears.



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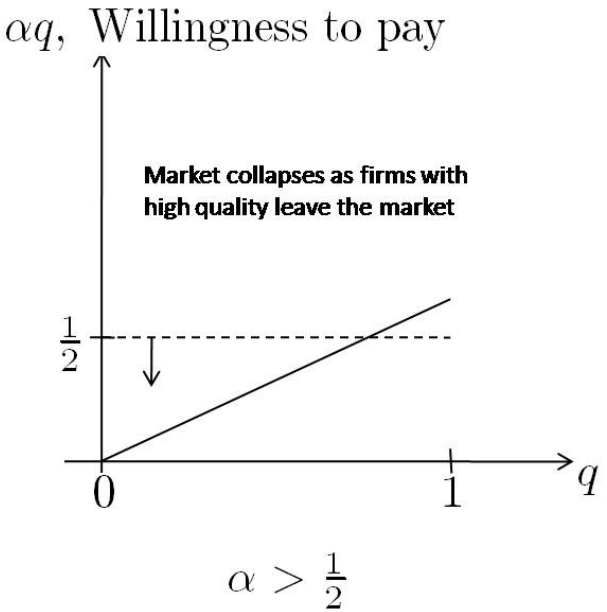

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Note: Maximal welfare W_{max} exploitable is $\int_0^1 (1-\alpha) q dq = \frac{1-\alpha}{2}$.

The Model: Timing

1. Certifier decides on prices for certification p_s, p_b.
2. Seller decides to pay the certifier p_s or not, if so quality q will be credibly announced (q is public information afterwards).
3. Buyers decide simultaneously whether to pay the certifier p_b (true quality q is then private information for the buyer).
4. Bidding stage for the product, modeled by a first-price-auction with common values; the seller's reservation utility αq serves as an (unknown) reserve price. (Assumption: The information structure among the bidders is known.) Payoffs are realized.

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Three different Models - A comparison

We will consider three different models:

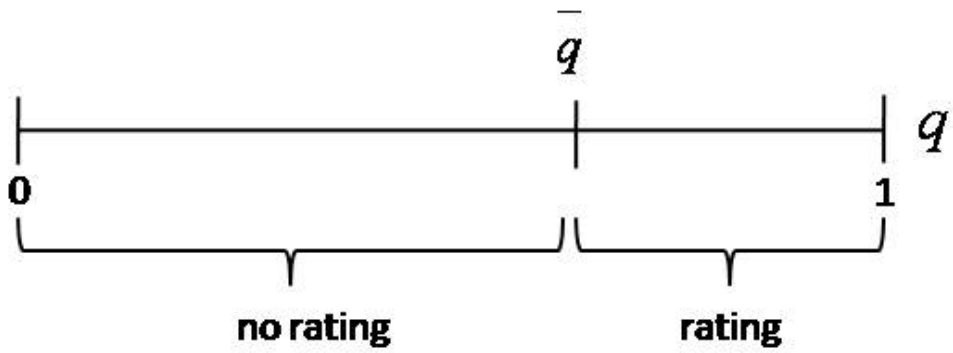
Sell certification service to seller's side only:

Sell certification service to buyers' side only:

Sell certification service to both sides:

Ratings on Seller Side only - Bidding Behavior

Each price p_s of the certifier induces a quality threshold $\bar{q}$ above which sellers order a rating.



The model is solved by backwards induction:

- Lemon Market:
  Uninformed buyers bid 0 and informed buyers bid q.
- Efficient Market:
  Uninformed buyers bid $q^e_{\bar{q}}$ and informed buyers bid q,
  where $q^e_{\bar{q}}$ is the expected quality in the unrated market.

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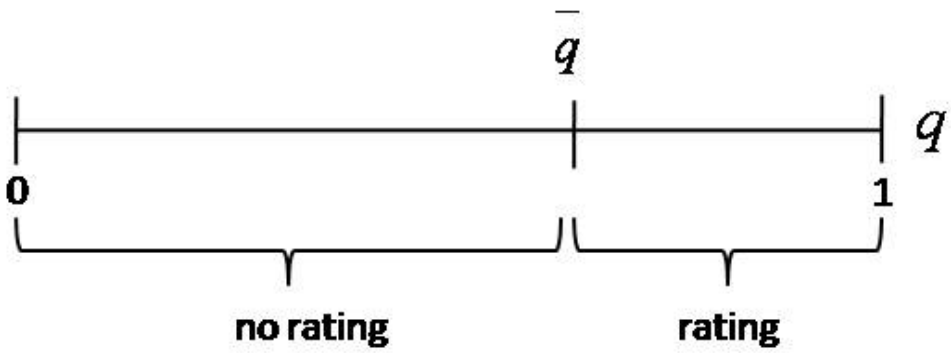

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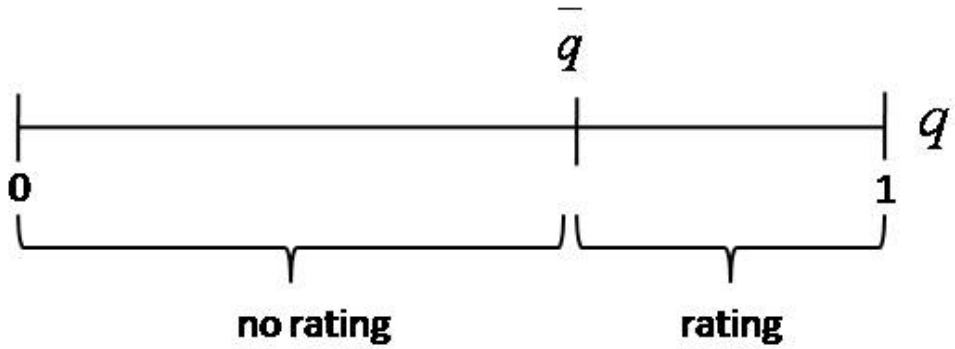

- Indifference conditions for the sellers:
  Lemon Market: $(1-\alpha)\bar{q} - p_s = 0$
  Efficient Market: $(1-\alpha)\bar{q} - p_s = \frac{1}{2}\bar{q} - \alpha\bar{q}$
- The quality thresholds are
  Lemon Market: $\bar{q} = \frac{p_s}{1-\alpha}$, $p_s \in [0, (1-\alpha)]$,
  Efficient Market: $\bar{q} = 2p_s$, $p_s \in [0, \frac{1}{2}]$.

Ratings on Seller Side only - Certifier Behavior

- Maximization problem of the certifier:

$$\max_{p_s} \Pi(p_s) = (1 - \bar{q}(p_s))p_s,$$

given the corresponding functions $\bar{q}(p_s)$ depending on market parameter α.

- Results:
Lemon Market ($\alpha > \frac{1}{2}$):

$$p_s = \frac{1-\alpha}{2},\ \bar{q} = \frac{1}{2},\ \Pi_C = \frac{1-\alpha}{4},\ \Pi_S = \frac{1-\alpha}{8},\ W = \frac{3}{8}(1-\alpha)$$

Efficient Market ($\alpha \leq \frac{1}{2}$):

$$p_s = \frac{1}{4},\ \bar{q} = \frac{1}{2},\ \Pi_C = \frac{1}{8},\ \Pi_S = \frac{1-\alpha}{2} - \frac{1}{8},\ W = W_{max} = \frac{1-\alpha}{2}$$

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Ratings on Buyer Side only - Bidding Behavior

- Recall: Two buyers compete to buy the product
- Each buyer decides whether to order a rating for a given certification price p_b

	informed	not informed
informed	(q, q)	$(\alpha q, 0)$ if $\alpha > \frac{1}{2}$ $(\frac{1}{2}q, F(b))$ if $\alpha \leq \frac{1}{2}$
not informed	$(0, \alpha q)$ if $\alpha > \frac{1}{2}$ $(F(b), \frac{1}{2}q)$ if $\alpha \leq \frac{1}{2}$	$(0, 0)$ if $\alpha > \frac{1}{2}$ (q^e, q^e) if $\alpha \leq \frac{1}{2}$

The distribution function of bids for a single uniformed buyer is given by $F(b) = 2b$.

- The buyer's decision depends on the profit from ordering a rating compared to the profit for staying uninformed
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Ratings on Buyer Side only - Information Acquisition

- There is no equilibrium in pure strategies.
- ...therefore buyers apply a mixed-strategy of buying private information.
- The value of being exclusively informed V_{ib} depends on market structure:
  Lemon Market: Expected payoff is $V_{ib}^{L} = \frac{1-\alpha}{2}$.
  Efficient Market: Expected payoff is $V_{ib}^{E} = \frac{1}{6}$.
- Each price p_b of the certifier induces a certain probability ω for the mixed strategy equilibrium:
  Lemon Market: $\omega = 1 - \frac{2p_b}{1-\alpha}$, $p_b \in [0, V_{ib}^{L}]$,
  Efficient Market: $\omega = 1 - 6p_b$, $p_b \in [0, V_{ib}^{E}]$.

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Ratings on Buyer Side only - Certifier Behavior

- Maximization problem of the certifier:

$$\max_{p_b} \Pi_C(p_b) = \omega(p_b)^2 2p_b + 2\omega(p_b)(1-\omega(p_b))p_b,$$

given the corresponding functions $\omega(p_b)$ depending on market parameter α.

- Results:
Lemon Market ($\alpha > \frac{1}{2}$):

$$p_b = \frac{1-\alpha}{4},\ \omega = \frac{1}{2},\ \Pi_C = \frac{1-\alpha}{4},\ \Pi_S = \frac{1-\alpha}{8},\ W = \frac{3}{8}(1-\alpha)$$

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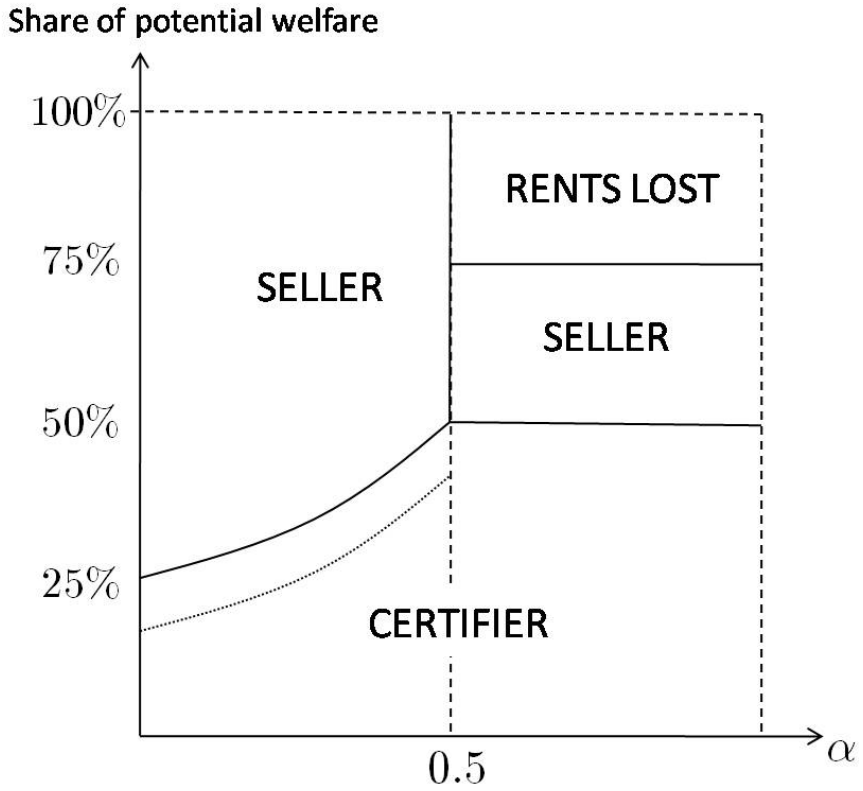
Ratings on Buyer or Seller Side: A comparison



- Certifier prefers to sell to seller side in an efficient market.
- Certifier is indifferent to which side to sell in a Lemon Market.
- For markets with $\alpha > \frac{1}{2}$ certification has a strong welfare increasing effect.

Ratings on Seller and Buyer Side - Bidding behavior

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The distribution function of bids for a single uniformed buyer is given by $F_{\bar{q}} = \frac{2}{\bar{q}}b$. In this case: $q^e_{\bar{q}} = \frac{\bar{q}}{2}$.

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Ratings on Seller and Buyer Side - Induced Rating Probability and Induced quality threshold

- Each price-combination (p_s, p_b) of the certifier induces a certain quality threshold $\bar{q}$ and a probability ω for the mixed strategy equilibrium:
- Indifference conditions for the sellers and the buyers:
  Lemon Market:
  $(1-\alpha)\bar{q} - p_s = \omega^2(1-\alpha)\bar{q}$ and $(1-\omega)V_{ib}^L(\bar{q}) - p_b = 0$
  Efficient Market: $(1-\omega^2)\frac{\bar{q}}{2} - p_s = 0$ and $(1-\omega)V_{ib}^E(\bar{q}) - p_b = 0$
- The quality thresholds and the rating probabilities are:
  Lemon Market: $\bar{q} = \frac{4p_b^2}{(1-\alpha)(4p_b-p_s)}$ and $\omega = \frac{p_s}{2p_b} - 1$ with p_s and p_b s.t. $0 \leq \bar{q}, \omega \leq 1$,
  Efficient Market: $\bar{q} = \frac{18p_b^2}{6p_b-p_s}$ and $\omega = \frac{p_s}{3p_b} - 1$,with p_s and p_b s.t. $0 \leq \bar{q}, \omega \leq 1$.

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given the corresponding functions $\bar{q}(p_s,p_b)$ and $\omega(p_s,p_b)$ depending on market parameter α.

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Lemon Market: $p_s = \frac{16}{27}(1-\alpha)$, $p_b = \frac{2}{9}(1-\alpha)$, $\bar{q} = \frac{2}{3}$, $\omega = \frac{1}{3}$, $\Pi_C = \frac{8}{27}(1-\alpha)$, $\Pi_S = (1-\alpha)\frac{17}{162}$ and $W = (1-\alpha)\frac{65}{162} \neq W_{max}$.
Efficient Market: $p_s = \frac{3}{2}(5\sqrt{5}-11)$, $p_b = \frac{1}{4}(7-3\sqrt{5})$, $\bar{q} = \frac{141-63\sqrt{5}}{36-16\sqrt{5}}$, $\Pi_C = \frac{3}{4}(5\sqrt{5}-11)$, $\Pi_F = \frac{1-\alpha}{2} - \Pi_C$ and $W = W_{max}$.

Ratings on Seller and Buyer Side - Certifier Behavior

- Maximization problem of the certifier:

$$\max_{p_s,p_b} \Pi_C(p_s,p_b) = (1-\bar{q})p_s + \bar{q}[\omega^2 2p_b + 2\omega(1-\omega)p_b]$$

given the corresponding functions $\bar{q}(p_s,p_b)$ and $\omega(p_s,p_b)$ depending on market parameter α.

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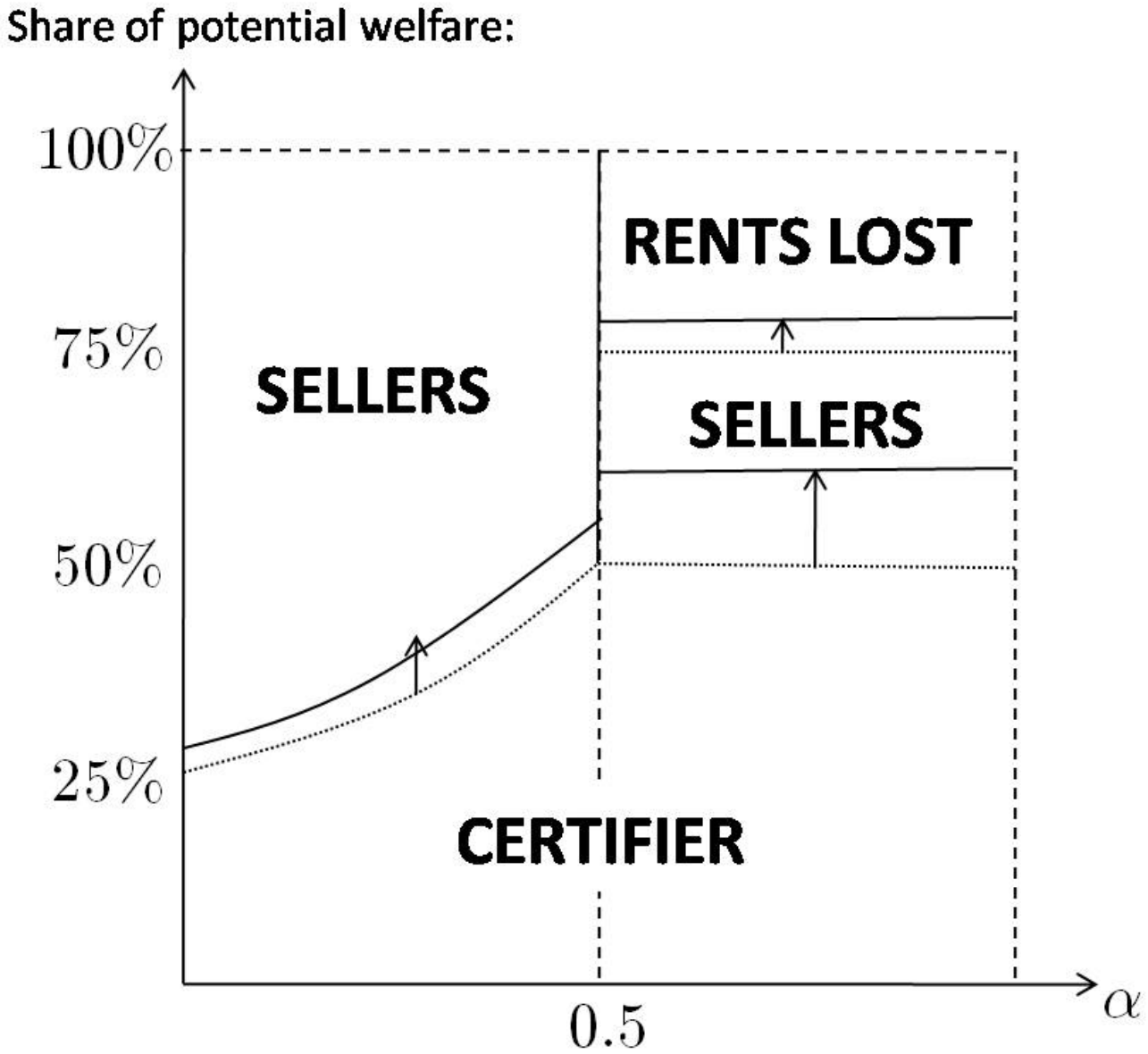
A comparison of the three models I

Table: Comparing equilibrium outcomes of different model settings

	Only sellers	Only buyers	Both sides
$\alpha > \frac{1}{2}$ (lemon market)			
price for seller rating	$\frac{1-\alpha}{2}$	-	$\frac{16}{27}(1-\alpha)$
price for buyer rating	-	$\frac{1-\alpha}{4}$	$\frac{2}{9}(1-\alpha)$
high-quality threshold	$\frac{1}{2}$	-	$\frac{2}{3}$
buyer's rating probability	-	$\frac{1}{2}$	$\frac{1}{3}$
profit certifier	$\frac{1-\alpha}{4}$	$\frac{1-\alpha}{4}$	$\frac{8}{27}(1-\alpha)$
profit seller	$\frac{1-\alpha}{8}$	$\frac{1-\alpha}{8}$	$\frac{17}{162}(1-\alpha)$
welfare	$\frac{3}{8}(1-\alpha)$	$\frac{3}{8}(1-\alpha)$	$\frac{65}{162}(1-\alpha)$
$\alpha < \frac{1}{2}$ (efficient market)			
price for seller rating	$\frac{1}{4}$	-	≈ 0.27
price for buyer rating	-	$\frac{1}{12}$	≈ 0.07
high-quality threshold	$\frac{1}{2}$	-	≈ 0.573
buyer's rating probability	-	$\frac{1}{2}$	≈ 0.24
profit certifier	$\frac{1}{8}$	$\frac{1}{12}$	≈ 0.135
profit seller	$\frac{1-\alpha}{2} - \frac{1}{8}$	$\frac{1-\alpha}{2} - \frac{1}{12}$	$\frac{1-\alpha}{2} - 0.135$
welfare	$\frac{1-\alpha}{2}$	$\frac{1-\alpha}{2}$	$\frac{1-\alpha}{2}$

A comparison of the three models II



A comparison of the three models III

- Efficient Market:
  Certifier's Share on Welfare increases from the range of 25%-50% to the range of $27\% - 54\%$ (increase in profit 8%).
- Lemon Market:
  Certifier's Share on Welfare increases from 50% to 60% (increase in profit 18.5%).
- Distribution of Revenues (Seller- vs. Buyer-Side):
  Efficient Market: 4:1 Lemon Market: 4:3
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Conclusion

- Certifiers profit from entering each kind of market.
- If a Certifier had to decide he would choose to sell on seller's side.
- Certifiers increase their profit by selling to both sides of the market.
- Welfare losses are reduced in inefficient markets.
- Traded volumes increase through the existence of rating agencies.

Policy Implications

- Depending on the market structure it is counterproductive to prohibit the sale to both sides.
- For inefficient markets it is even desirable to have a certifier (a Rating Agency).
- The observed revenue shares in the real world are not a sufficient reason to argue that conflicts of interest distort the quality of ratings.
- Concerning regulation: Better try to assess the quality of the predictions made by the Rating Agencies, than dictating where they sell their service.

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