Market Screening

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Screening in markets with competing uninformed parties

Players and timing: competing uninformed parties make offers; then privately-informed party chooses among these offers.

Applications:

- Insurance markets: purchasers privately informed about their risk status and/or their risk tolerance; insurers' policies specify premium and benefits.
- Financial markets: seller (issuer of a security) privately informed about quality (future return steam); buyers' offers specify price and quantity.
- Credit markets: borrowers privately informed about distribution of project returns, hence about default risk; lenders' loan contracts specify interest rate and collateral.
- Product markets: buyers privately informed about preferences; sellers' policies specify how price varies with quantity or quality

Important distinctions relevant to market screening

1. Are there *competing* uninformed parties?
   - If yes, "market screening"; if no, "optimal contracting" ("monopolistic screening").

2. Does private information *directly* affect the payoff of all parties or only the informed?
   - If all parties, "common-value" environment (e.g. risk status, quality of financial asset, quality of borrower's project, worker's ability).
   - If only the informed, "private-value" environment (e.g. buyer's product valuation, risk tolerance, supplier's cost of effort).

3. Can informed party sign contracts with many or just one uninformed parties?
   - If just one, "exclusive contracting" (e.g. car insurance, some labour markets).
   - If many, "non-exclusive contracting" (e.g. financial markets, product markets).

Classification of hidden information models

	Monopolistic uninformed	Competition among uninformed
Uniformed moves first	Optimal contracting	Market screening with exclusive contracts: U offers single option
		Market screening with non-exclusive contracts: U offers menu
Informed moves first	Signalling	Market signalling

We'll focus here on market screening with exclusive contracts in a common-value environment.

Screening in competitive markets with exclusive contracts

For ease of comparison, we'll analyze *same* market as for signalling.

Players: a privately informed worker and a large number of identical firms, with same preferences as in signalling analysis.

Timing of the model:

1. Worker privately observes ability $n \in \{L, H\}$; firms believe $Pr(n = H) = q$.
2. Each firm offers a "contract" (w, e).
3. Worker chooses the most-preferred contract.
4. Worker acquires the education level and receives the wage specified in the chosen contract.

Strategies: firm i: (w_i, e_i); worker: (w, e) from among $\{(w_i, e_i)\}_{i=1}^{N}$.

Equilibrium concept: subgame perfect Nash equilibrium (SPE).

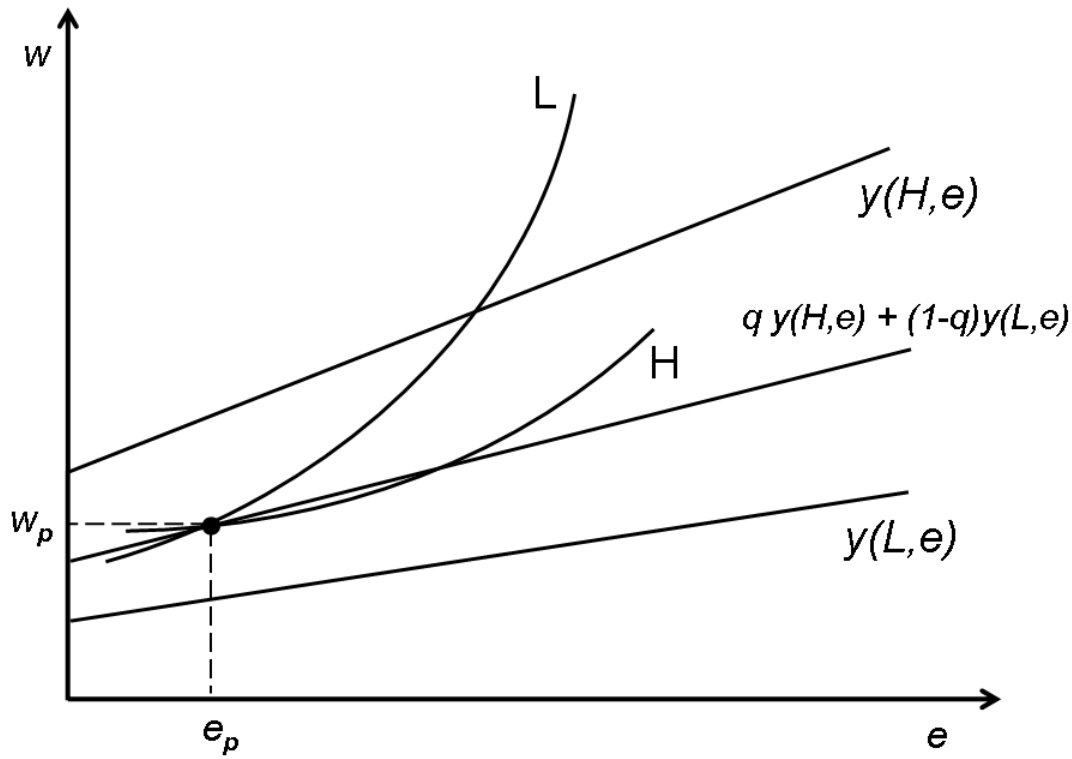
i) Even though each firm offers only one (w, e) option, in equilibrium the market as a whole may offer a menu of (w, e) pairs.

ii) With competition in exclusive contracts, even if each firm could offer a menu, pure-strategy SPE outcomes would be unchanged.

Properties of SPEs in the market screening model

Proposition. In a SPE, any contract chosen by worker must earn 0 profit.

Proposition. A SPE cannot be a pooling equilibrium.

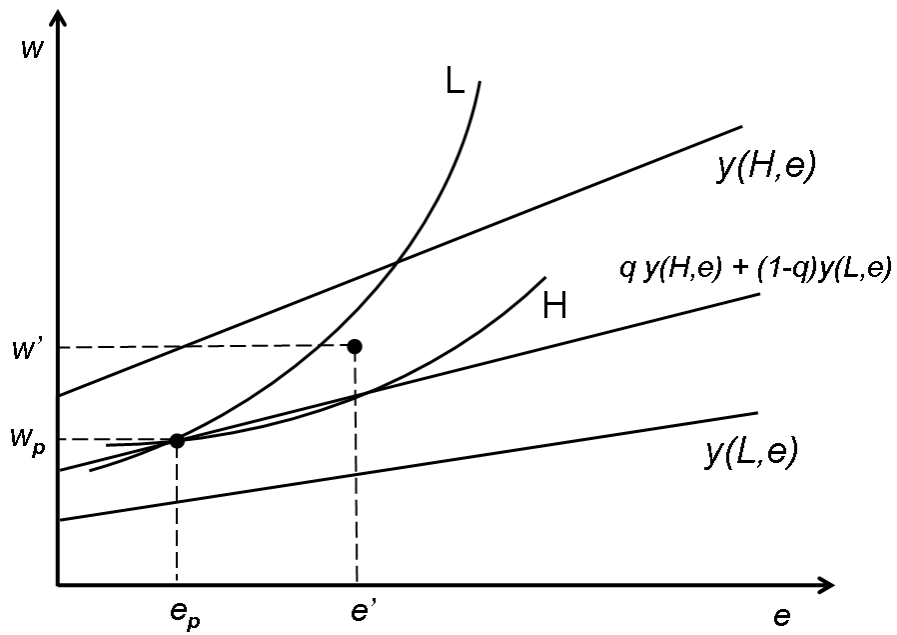


Properties of SPEs in the market screening model

Proposition. A SPE cannot be a pooling equilibrium.

Proof. A firm that offers (w', e'), given that other firm(s) offer (w_p, e_p), will attract only H-type and will make positive profits, since $y(H, e') > w'$. □

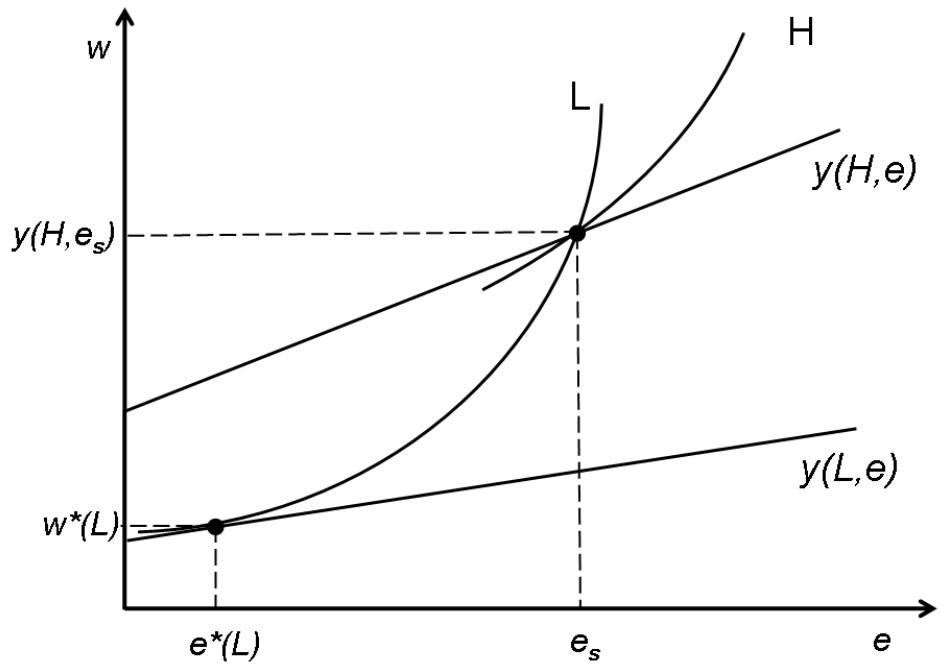
The deviation to (w', e') is a "cream-skimming" deviation.



Proposition. In a SPE, no contract (w, e) can be chosen with positive probability by both types. (Proved by same logic as in diagram above.)

There is a unique candidate SPE

Proposition. The only candidate SPE has L-type choosing $(w^*(L), e^*(L))$ and H-type $(y(H, e_s), e_s)$.



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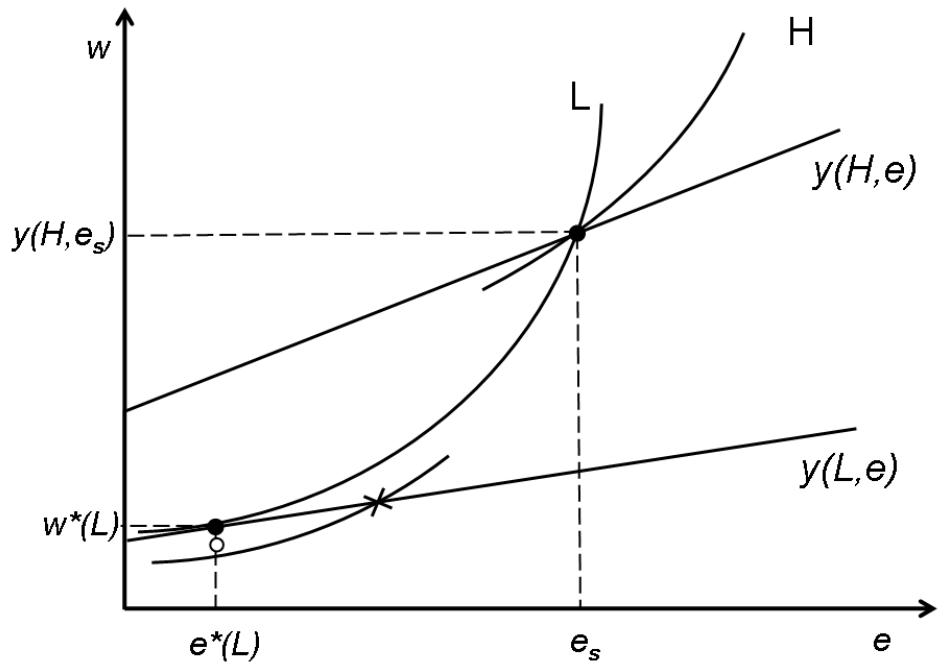

Proof. If L-type does not get $(w^*(L), e^*(L))$, a firm could offer $(w^*(L) - \delta, e^*(L))$, with $\delta > 0$ small enough that L-type would prefer this; this contract would earn the firm positive profit.

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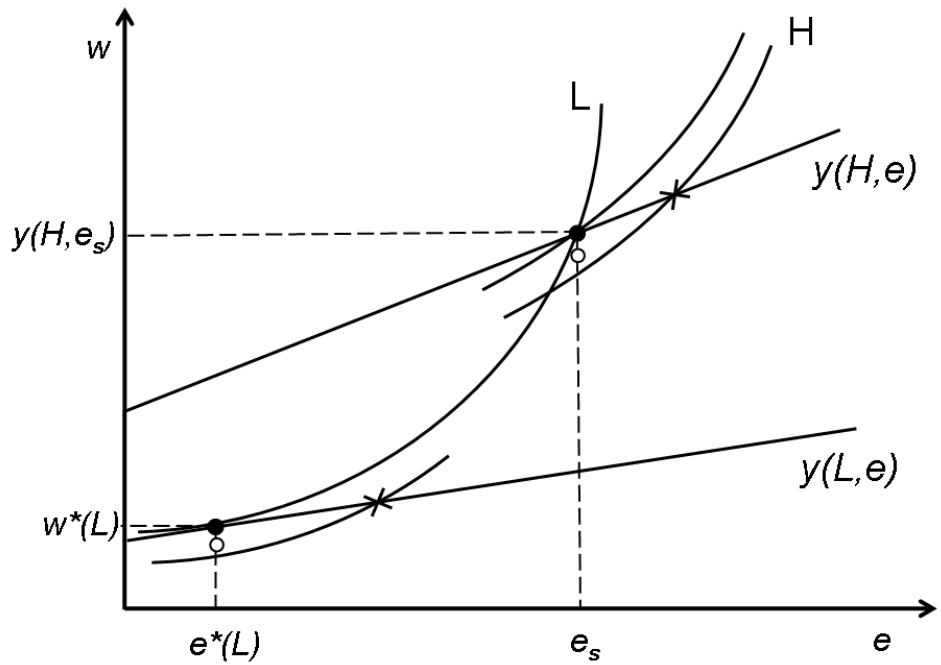


Proof. If L-type does not get $(w^*(L), e^*(L))$, a firm could offer $(w^*(L) - \delta, e^*(L))$, with $\delta > 0$ small enough that L-type would prefer this; this contract would earn the firm positive profit. Similarly, if H-type does not get $(y(H, e_s), e_s)$, a firm could profitably offer $(y(H, e_s) - \delta, e_s)$ for some $\delta > 0$; since L-type gets $(w^*(L), e^*(L))$, contract does not attract L-type. □

Does a subgame perfect equilibrium (SPE) exist?

Define Case A (low prob q of H-type) and Case B (high prob q of H-type) exactly as in signalling analysis.

Proposition

a) *In Case A (low prob q of H-type), there is a unique SPE.*

b) *In Case B (high prob q of H-type), no SPE exists.*

Proof.

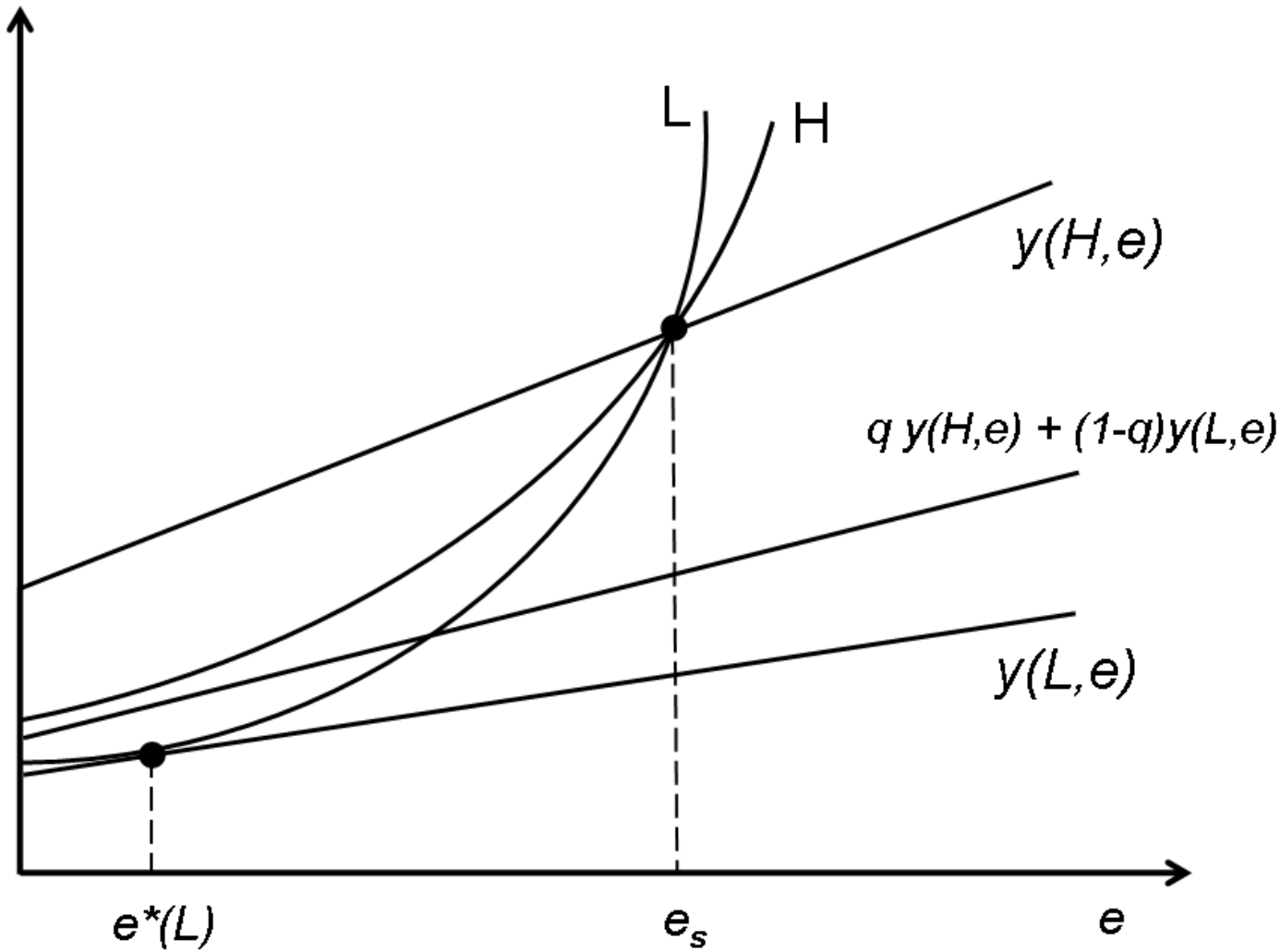
a) No new contract can be profitable: any contract that attracts both types must lie above $qy(H, e) + (1 - q)y(L, e)$; any contract that attracts only H-type must lie above $y(H, e)$; and any contract that attracts only L-type must lie above $y(L, e)$.

b) A firm that offered (w_p, e_p) would break the candidate SPE; it would attract both types and earn positive profits.

□

Existence of SPE - Case A (low prob q of H-type)

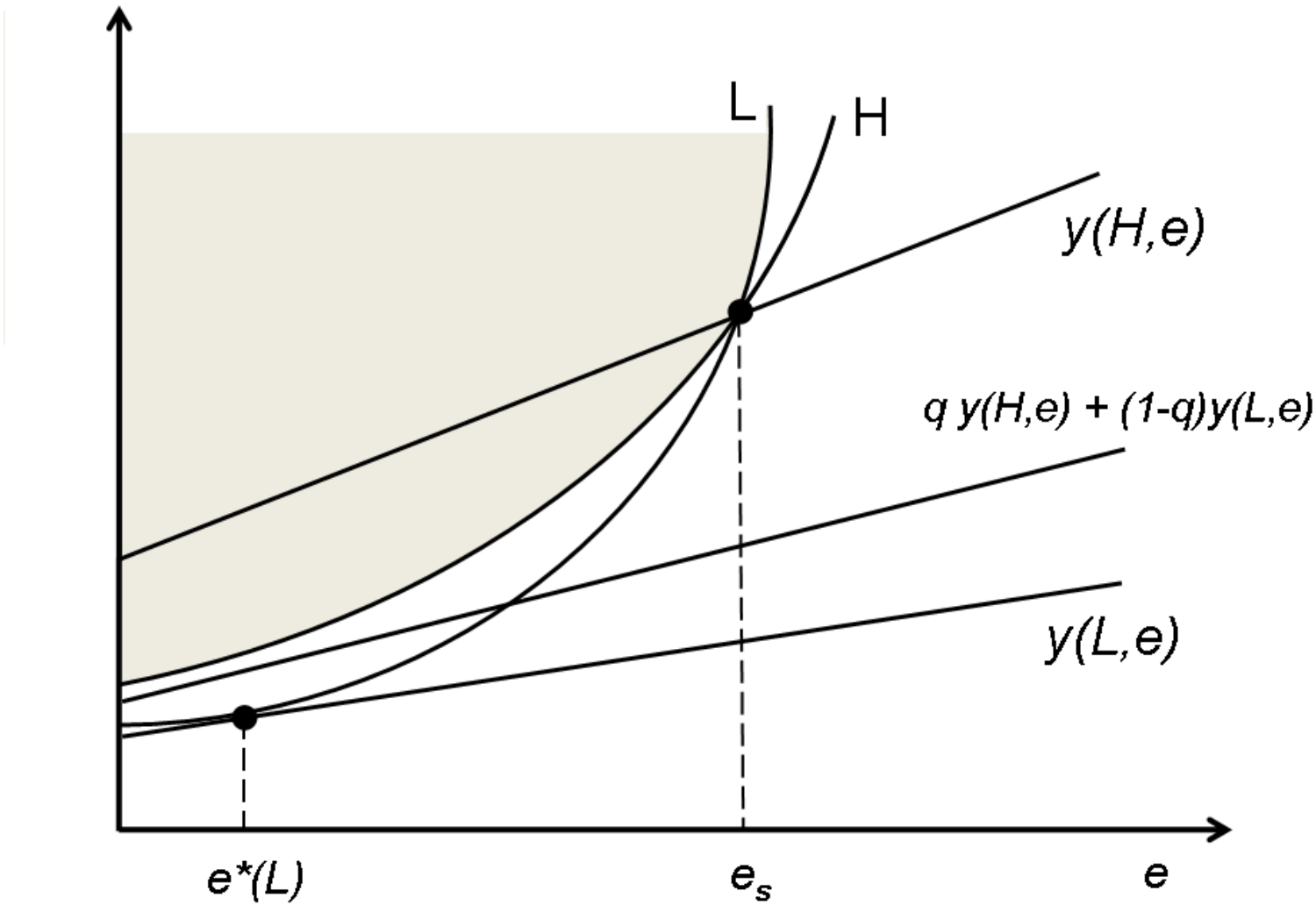
There is a unique SPE.



Existence of SPE - Case A (low prob q of H-type)

There is a unique SPE.

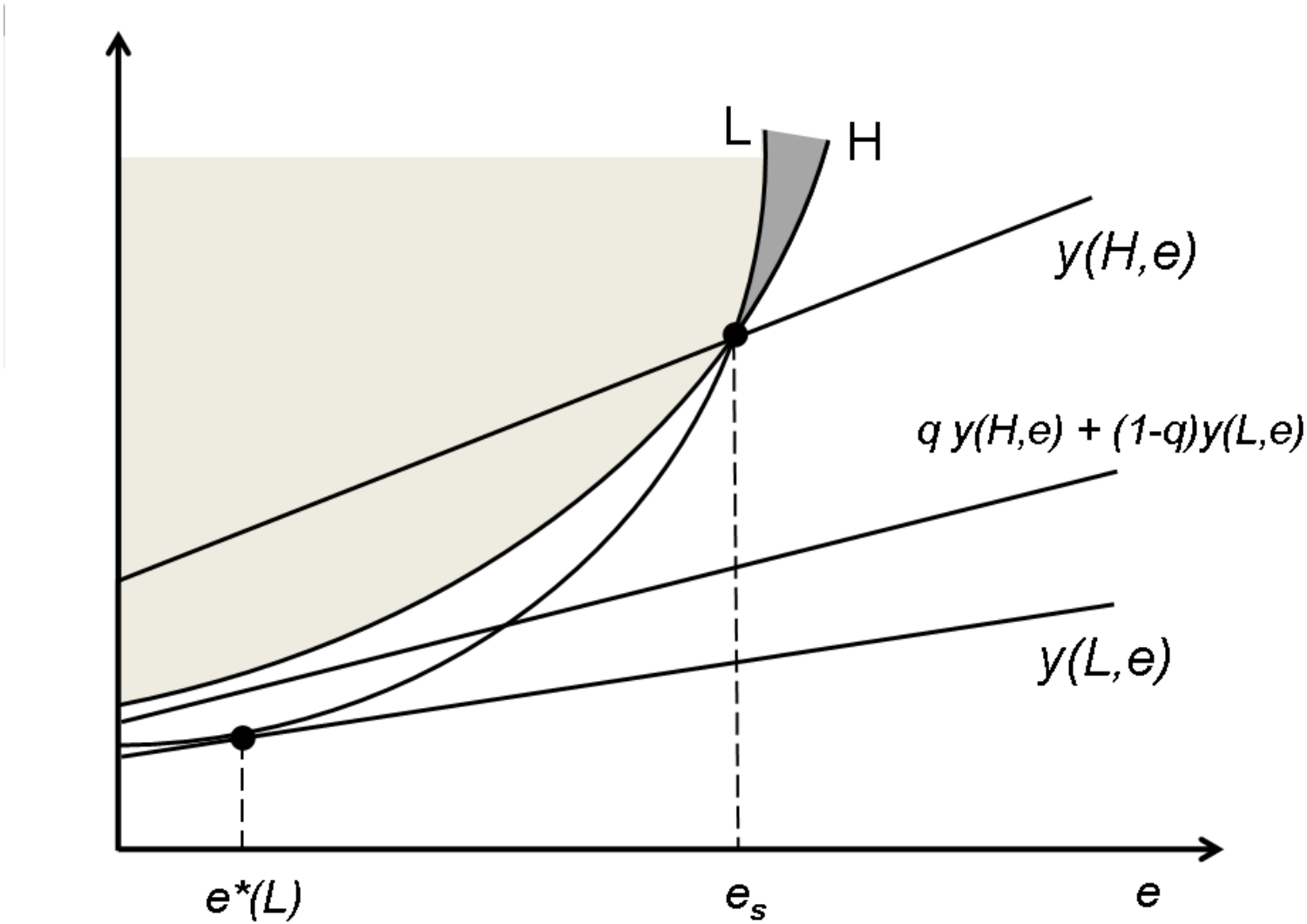
No deviation that attracts both types can be profitable.



Existence of SPE - Case A (low prob q of H-type)

There is a unique SPE.

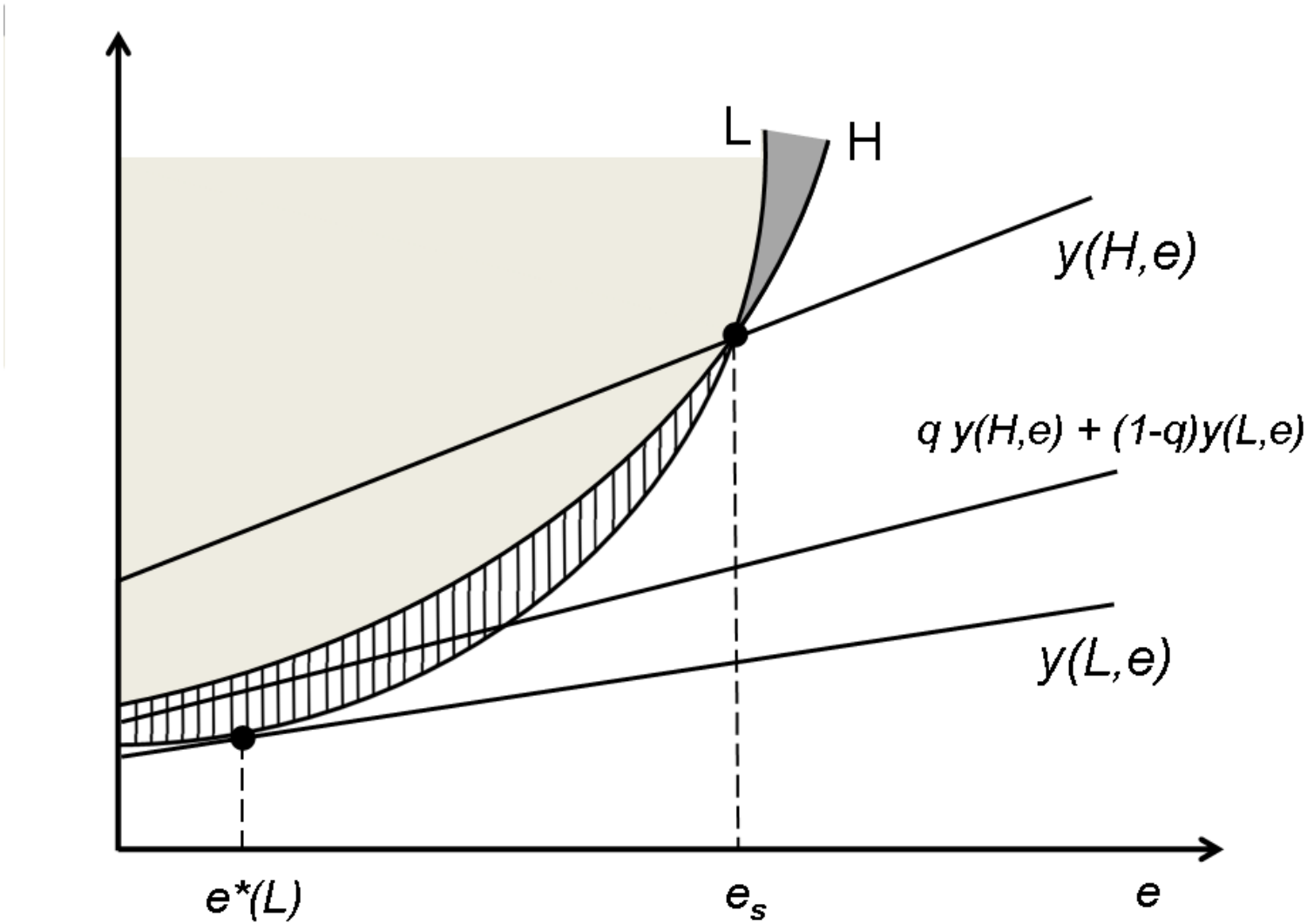
No deviation that attracts only H-type can be profitable.



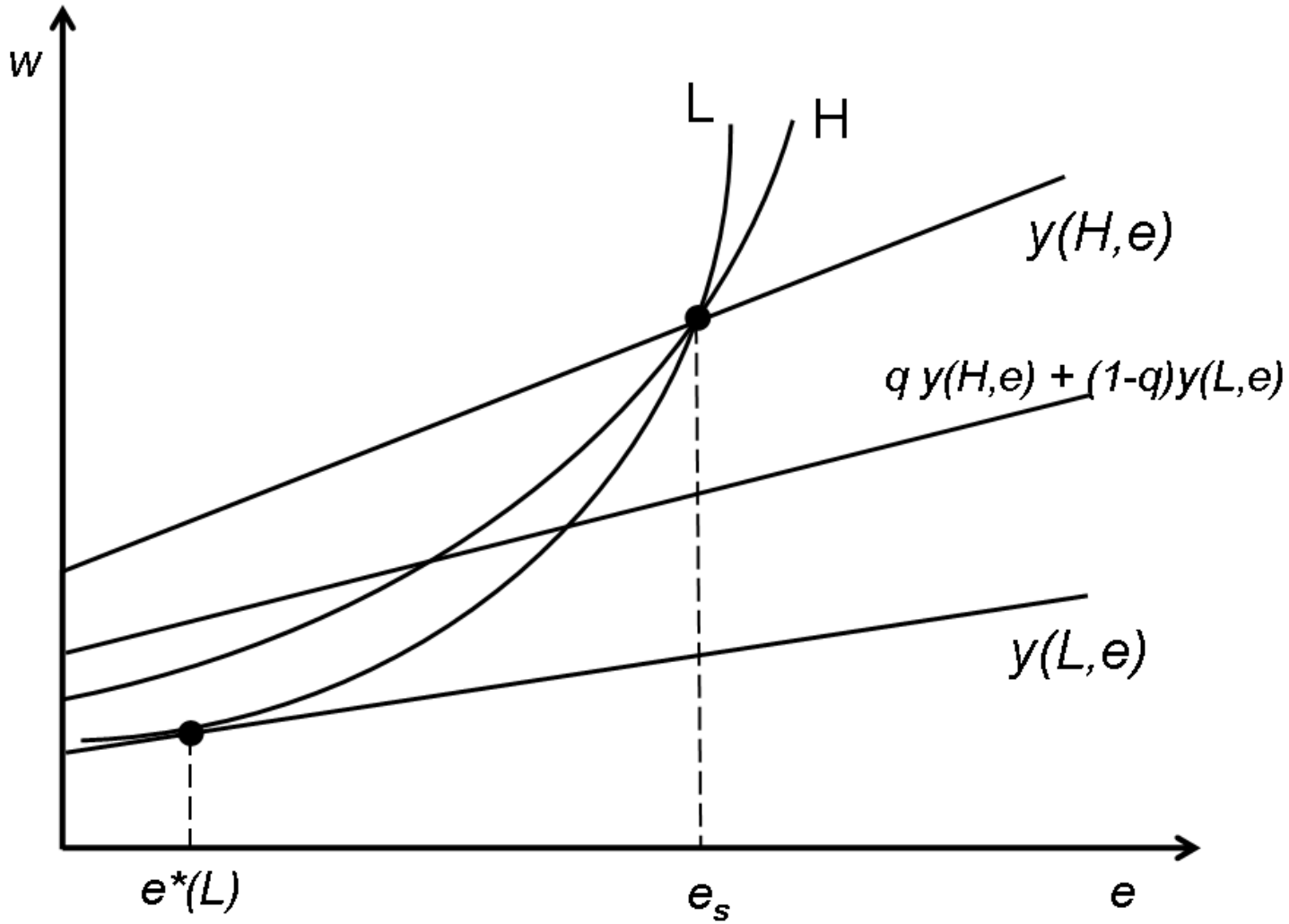
Existence of SPE - Case A (low prob q of H-type)

There is a unique SPE.

No deviation that attracts only L-type can be profitable.

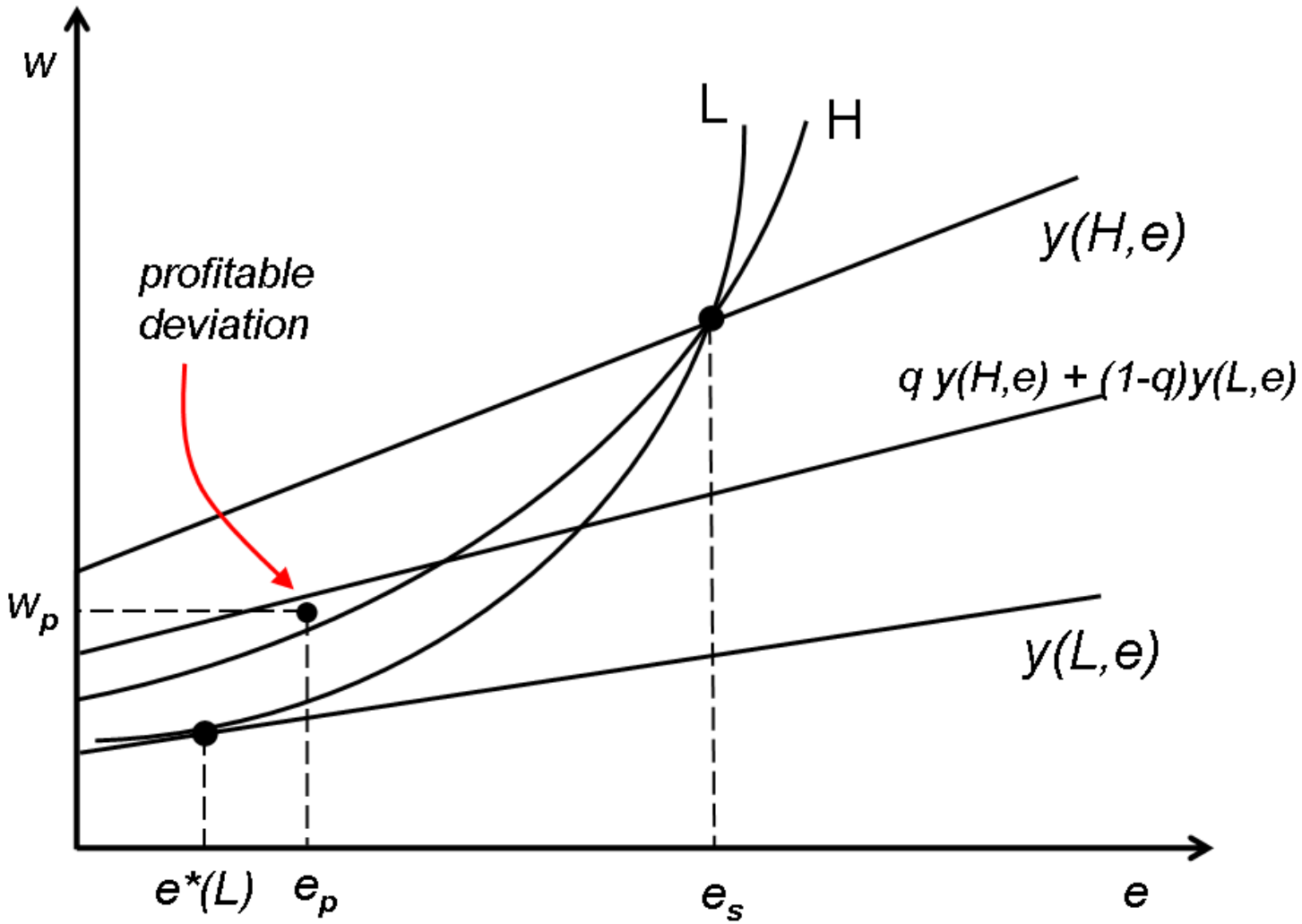


Non-existence of SPE - Case B (high prob q of H-type)



Non-existence of SPE - Case B (high prob q of H-type)

No SPE exists: there is a profitable deviation from the candidate separating SPE. This deviation would attract both types.



Implications

In a common-value environment, a competitive mkt with screening via exclusive contracts may have no SPE, hence may be unstable.

- First shown by Rothschild and Stiglitz (1976) in context of insurance markets.
- SPE is less likely to exist when a pooling contract yields higher expected profit (when prob. of "good type" is higher) or when it is easier to attract both types (when cost functions of the types are more similar).
- If there is a continuum of types, equilibrium does not exist (Riley, 1979).

Analysis of competitive screening with *non-exclusive contracts* (e.g. Attar et al, 2011) suggests that

i) equilibrium existence is less problematic, and
ii) outcomes can differ from those under exclusive competition.

So important to model the appropriate type of competition.

Screening in insurance markets: Rothschild-Stiglitz (1976)

- Purchasers differ in their risk status: either high-risk or low-risk.
- Insurance companies compete by offering policies specifing premium and benefits.
- Under full information, both types purchase full insurance coverage, but premium for high-risk type is strictly higher, so high-risk type envies low-risk type.
- When risk status is privately known by purchasers, if a SPE exists, high-risk type buys full insurance, while low-risk type buys less complete coverage.
  - Hidden info. results in inefficient distortion of eqm. allocation for low-risk type (the envied type under full info.).
  - The direction of distortion allows self-selection to occur: high-risk type is hurt more than low-risk type by incomplete coverage, so is deterred from choosing policy designed for low-risk type.

Screening in insurance markets

- Prediction of Rothschild-Stiglitz (1976) model: When risk status is privately known by purchasers, if a SPE exists, high-risk type buys full insurance, while low-risk type buys less complete coverage.
- So market screening model with *hidden info. about risk status* predicts *positive correlation* between insurance coverage and risk occurrence.
  - Positive correlation corresponds to **adverse selection**: those willing to pay the highest price are the most costly to serve.
- Greater insurance coverage may also reduce incentives to exert effort to lower risk—this *hidden-action* argument also implies *positive correlation* btw. insurance coverage and risk occurrence, though here the direction of causation is opposite.
- But empirically, this correlation is positive in some insurance markets and negative in others.

Multiple dimensions of hidden info in insurance markets

Cutler, Finkelstein, and McGarry (2008) suggest an explanation for this puzzle:

- Purchasers have *private info. about risk aversion* as well as risk status.
- Those with higher risk aversion both purchase more coverage and, for any level of coverage, exert more effort to reduce risk.
- These two effects can together generate *negative correlation* between insurance coverage and risk occurrence.
  - This is so even if, for a given individual, more coverage induces less effort (hidden action).
  - A negative correlation corresponds to **advantageous selection**: those willing to pay the highest price are the least costly to serve.

The lesson: Empirically, multiple dimensions of private information seem to be important in insurance markets.