

Forward Contracts and the Curse of Market Power

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Introduction

- Features of power generation
 - Economies of scale are limited
 - Markets are concentrated
 - Markets are open to entry
- Questions
 - In the absence of economies of scale, can markets with large firms be efficient?
 - Are forward sales effective at deterring entry?

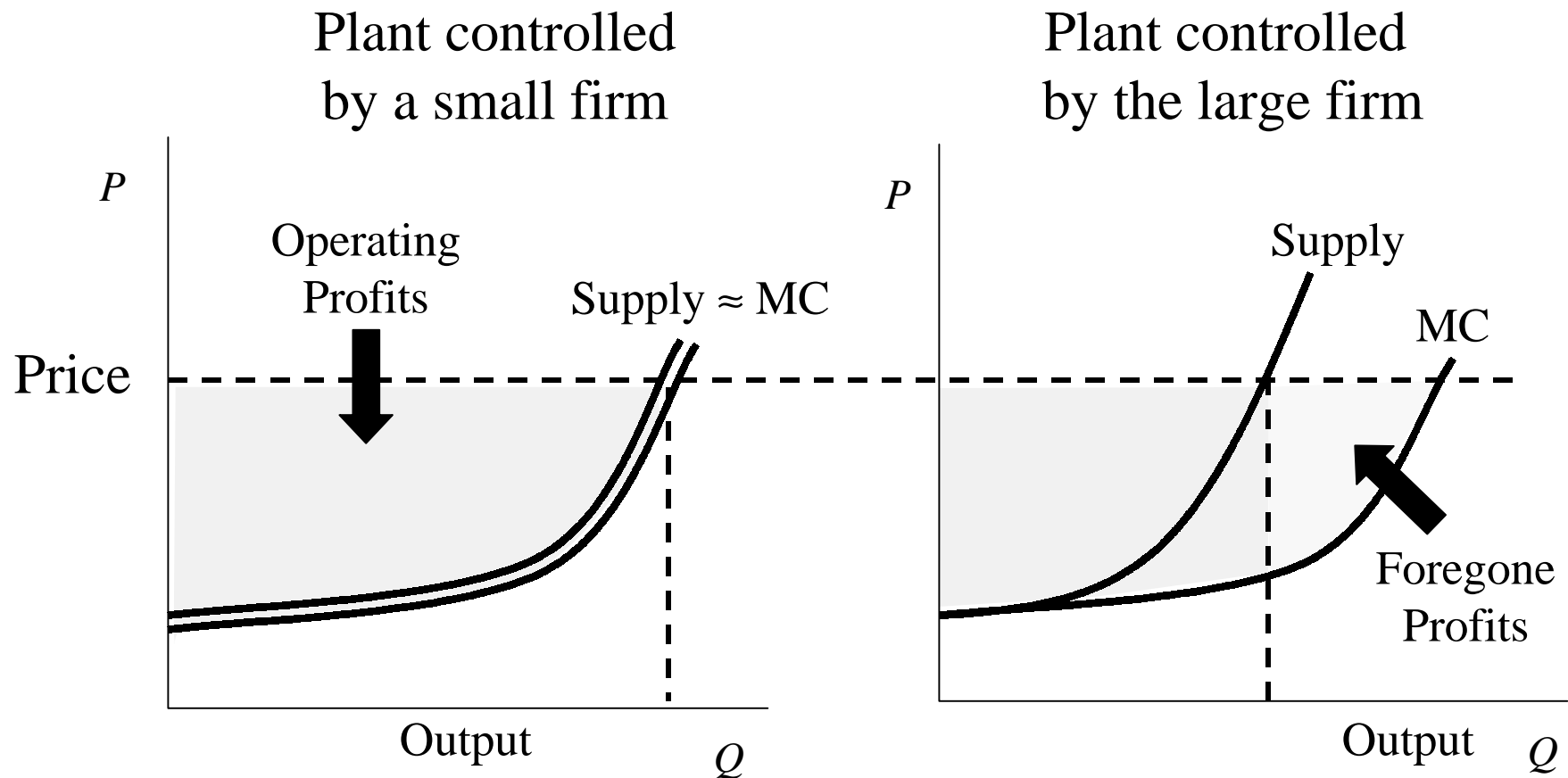
Outline

- Informal example of the curse of market power
- Forward sales as a cure for the curse of market power
- Results of theoretical model involving forward sales and entry
- Conclusion

An informal example

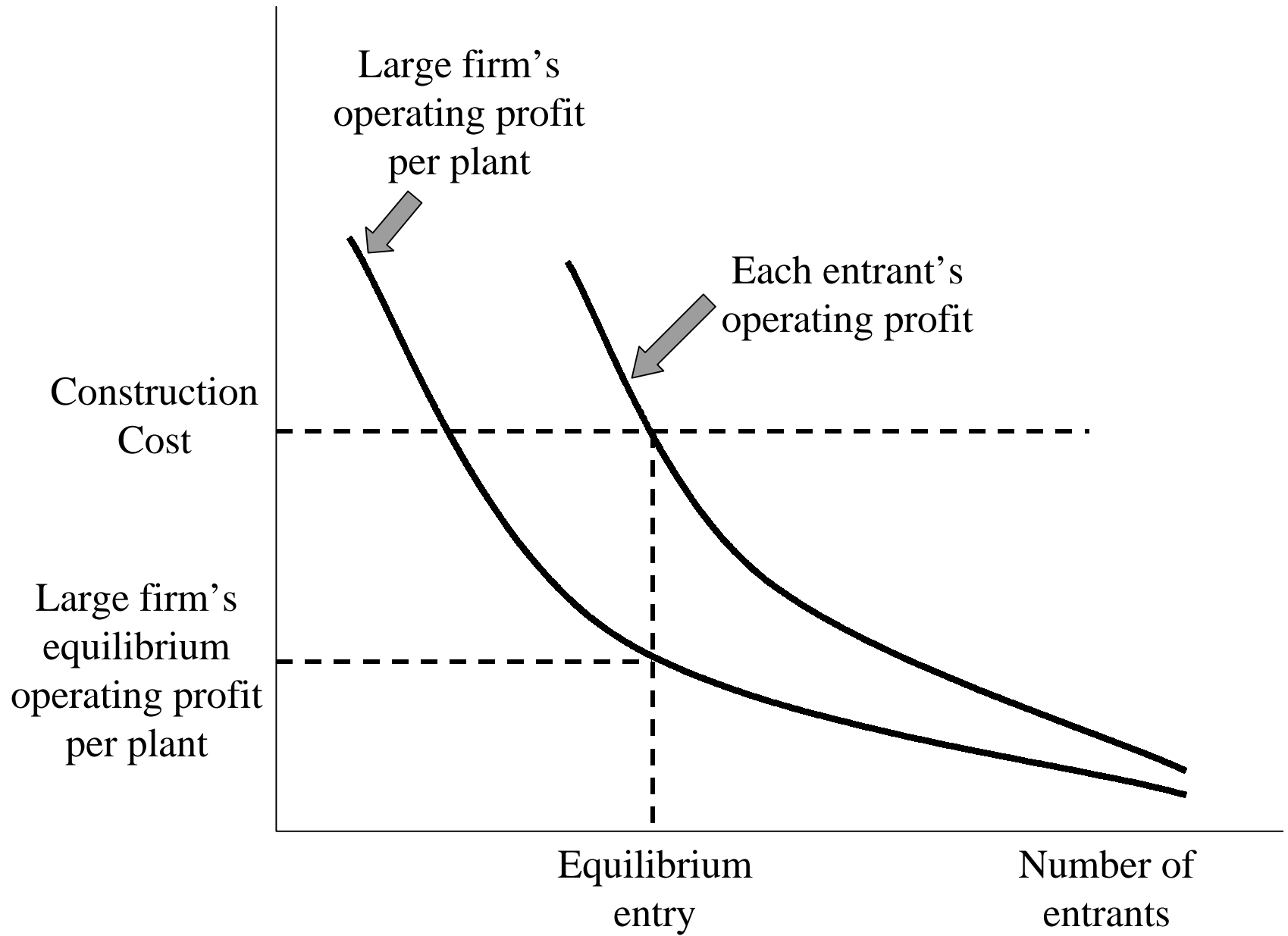
- 100 identical power plants
- 1 firm owns 50 plants
- 50 firms own 1 plant
- Firms simultaneously submit supply functions to maximize profits
- Markets clear as a uniform price auction

Small firms free-ride on large firm



Informal example with entry

- Incumbent owns 50 plants
- Large pool of potential entrants each can build 1 plant
- After entry, firms submit supply functions



The curse of market power

- Large firm incurs the cost of withheld output, but all firms benefit from high prices
- Entry sets an upper bound on operating profits per plant
- Large firm uses resources inefficiently and fails to reach the upper bound
- *Forward sales can cure the curse of market power*

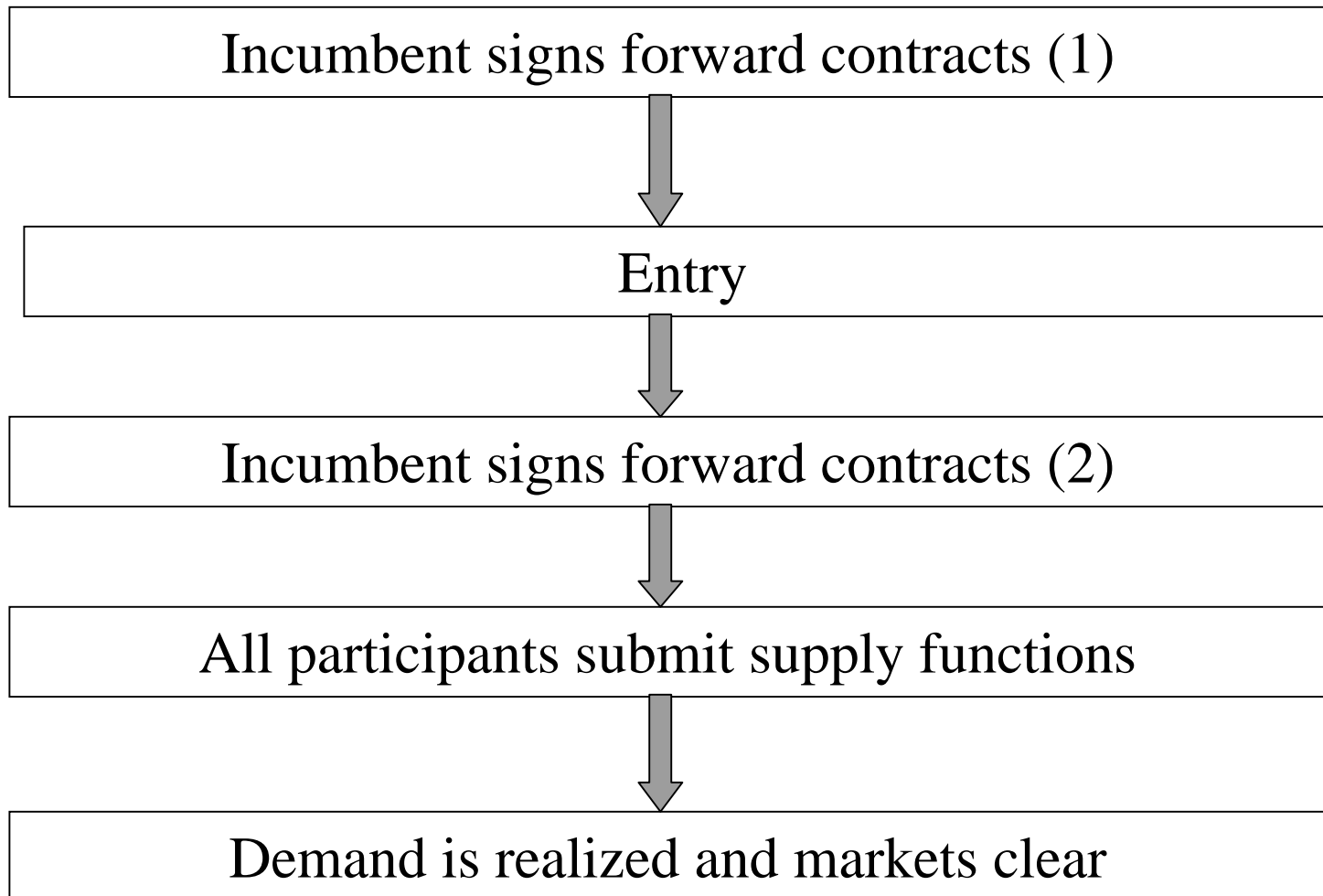
Forward contracts and aggressive spot market behavior

- Less output clears in the spot market
- Less incentive to push up spot price
- Forward sales make a rival duopolist produce less
 - Cournot spot market
 - Allaz and Villa (1993)
 - Uniform price auction spot market
 - Green (1992, 1999)
 - Newbery (1998)

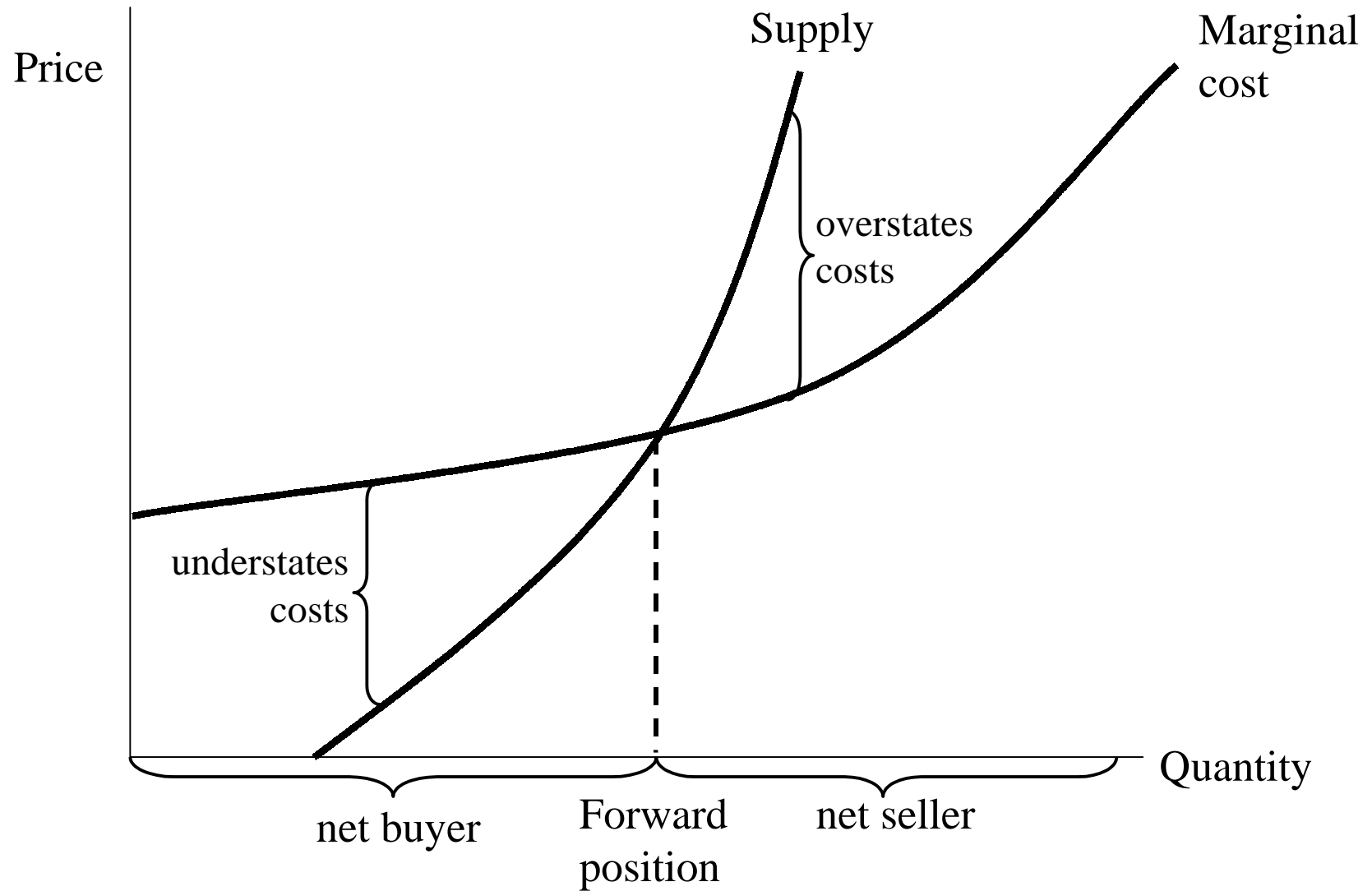
Participants in my model

- One large incumbent producer
- Competitive fringe of producers which expands in anticipation of profit opportunity
- Forward market traders
- All participants are
 - risk neutral
 - fully rational

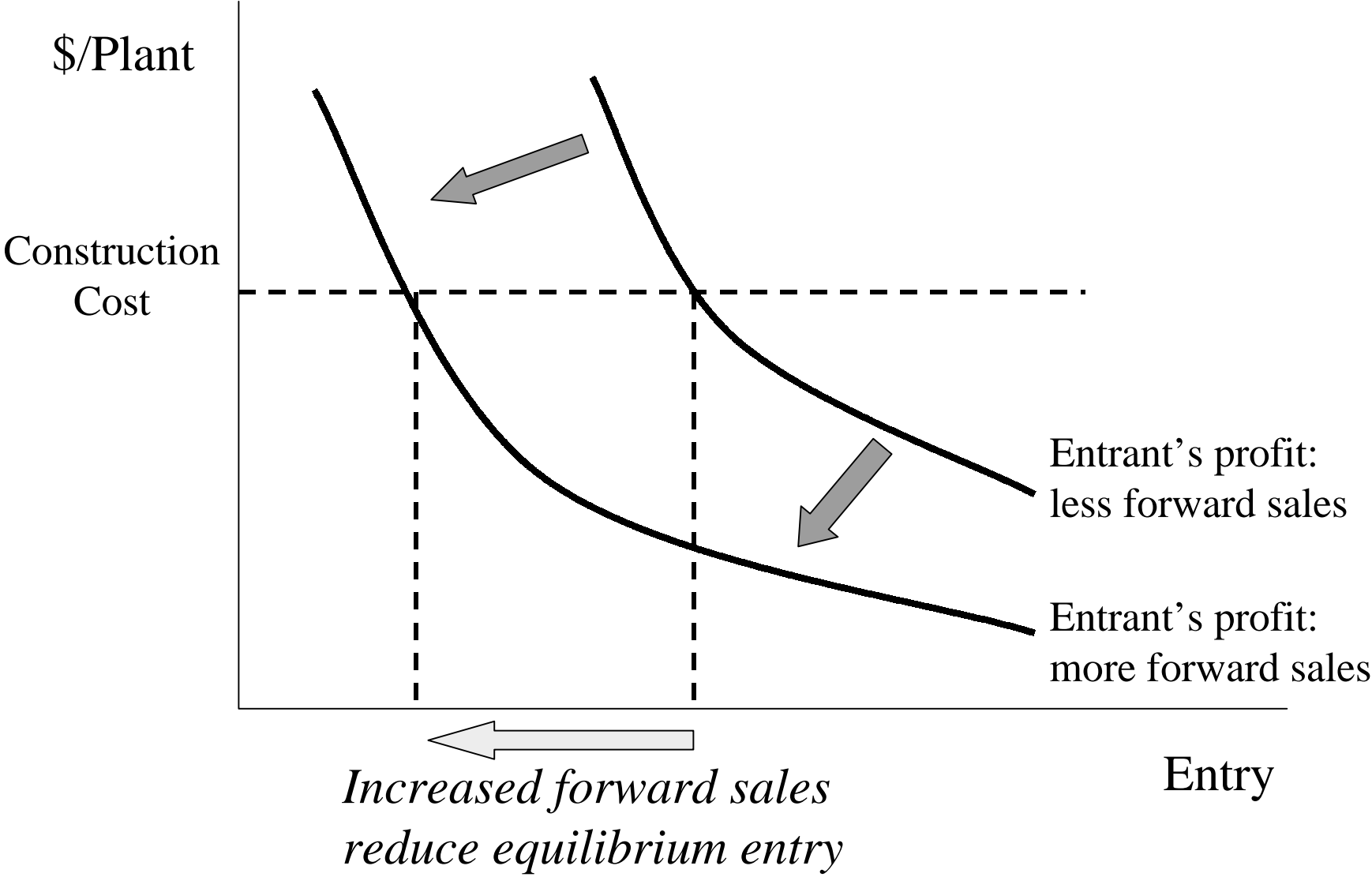
Sequence of events



Optimal spot market behavior



Entry deterrence



Optimal choice of forward sales

- The original forward position is credible
 - Large producer has no incentive to trade in forward market after entry is complete
- Original choice of forward sales - consider three cases
 - No uncertainty in demand
 - Uncertainty in demand – baseload entry
 - Uncertainty in demand – linear marginal costs

Optimal choice of forward sales

No uncertainty in demand

- The large producer
 - sells all output in the forward market
 - produces such that price equals marginal cost
 - eliminates the curse of market power
- Entry and production are efficient

Optimal choice of forward sales

Uncertainty in demand – baseload entry

- The large producer
 - sells forward such that its expected marginal cost equals the expected spot price
 - submits a supply function that is steeper than marginal cost
 - earns more profits than it would if it committed to submitting marginal cost
- Production is not completely efficient

Optimal choice of forward sales

Uncertainty in demand – linear marginal costs

- The large producer
 - sells forward less than its expected spot market production
 - submits a supply function that is steeper than marginal cost
 - does not use its resources as efficiently or profitably as entrants
 - does not entirely cure the curse of market power
- Production is not completely efficient

Conclusions

- Forward sales enhance long-run profitability and efficiency
 - Large firm's profits
 - No uncertainty – the upper bound can be achieved
 - Uncertainty – may be more than in the case of marginal cost commitment
 - Market efficiency
 - No uncertainty – first-best efficient outcome
 - Uncertainty – efficiency gains are not complete