Merger Policy with Merger Choice

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Preliminary and incomplete

Introduction

- Traditional approach to review of horizontal mergers:

  Market power vs. efficiency gains

- Seminal papers:
  - Williamson (*AER*, 1968)
  - Farrell-Shapiro (*AER*, 1990)

- Literature typically considers a single merger in isolation:

  1. No possibility of future mergers.

  2. No possibility of alternative mergers today.

- Our first paper, *Dynamic Merger Review* (JPE, forthcoming), has addressed the first point.

- This paper, *Merger Policy with Merger Choice*, addresses the second point.

Merger Policy with Merger Choice

- Optimal policy when firms can choose *which* merger to propose.

- **Simplest possible setting:** Single target (firm 0), several potential acquirers. At most one merger can be proposed to the antitrust authority. No dynamics.

- **Main result:** Antitrust authority adopts a minimum CS-standard that is increasing in the size of the merging firms.

- Provides a justification for discriminating between mergers based on naive computation of post-merger Herfindahl index (over and above apparent effect on CS).

- Related papers:
  - Lyons (*Mimeo*, 2002). Identifies issue: When choosing between mergers, interests of firms and antitrust authority not perfectly aligned.
  - Armstrong and Vickers (*Econometrica*, 2010). Abstract model that considers same issue. All projects (mergers) ex ante identical. Industry treated as an "agent." (Literature on delegated agency without transfers.)

The Model

- Homogeneous-goods Cournot model with constant returns to scale.

Assumption 1 *For any* $Q > 0$ *such that* $P(Q) > 0$*:*
(i) $P'(Q) < 0$*;*
(ii) $P'(Q) + QP''(Q) < 0$*;*
(iii) $\lim_{Q\to\infty} P(Q) = 0$*.*

- Assumption implies that there exists a unique equilibrium. Unique equilibrium is stable.

- K potential mergers, M_1 to M_K, each between firm 0 and merger partner $k \in \{1, ..., K\}$.

- Firms 1 to K ordered by pre-merger marginal costs: $c_1 > c_2 > \cdots > c_K$.

- There may be other firms in the industry.

- Merger: $M_k = (k, \bar{c}_k)$, where $\bar{c}_k \in [l, h_k]$ is post-merger marginal cost.

  – Feasibility and cost is stochastic, and independent across mergers. Set of realized feasible mergers is $\mathfrak{F}$ (the "null merger" M_0 is always in this set).

  – Assume no mass points and full support of post-merger marginal costs.

- Pre-merger equilibrium:

$$\{q_i^0\}_{i=0}^N, Q^0, CS^0, \{\pi_i^0\}_{i=0}^N.$$

- Equilibrium after merger M_k:

$$\{q_i(M_k)\}_{i=1}^N, Q(M_k), CS(M_k), \{\pi_i(M_k)\}_{i=1}^N.$$

- Induced change in CS:

$$\Delta CS(M_k) \equiv CS(M_k) - CS^0.$$

- Change in bilateral profit of merger partners:

$$\Delta\Pi(M_k) \equiv \pi_k(M_k) - [\pi_0^0 + \pi_k^0].$$

- **Antitrust policy:** Commitment to approval set $\mathcal{A} \equiv \{M_k : \bar{c}_k \in \mathcal{A}_k\} \cup M_0$.
  - At most one merger can be evaluated.
  - No randomization.
  - Null merger M_0 is always in this set.
  - Restrict attention to unions of closed intervals.
- For most of talk, antitrust authority's objective is to maximize expected consumer surplus.
- **Key issue:** Given antitrust policy, which merger M_k (if any) will be proposed?

- **For now:** Bargaining process given by Segal's offer game (QJE, 1999).
  - Making take-it-or-leave-it offer, firm 0 sells itself to firm of its choosing. If offer is rejected, there is no merger.
  - Firm 0's program:

$$\max_{M_k} \Delta\Pi(M_k) = \pi_k(M_k) - [\pi_0^0 + \pi_k^0].$$

  - That is, firm 0 chooses the merger M_k that maximizes induced change in bilateral profit of merging parties.

- Define:

$$M^*(\mathfrak{F}, \mathcal{A}) \equiv \arg \max_{M_k \in \mathfrak{F} \cap \mathcal{A}} \Delta\Pi(M_k).$$

- Antitrust authority solves:

$$\max_{\mathcal{A}} E_{\mathfrak{F}} \left[\Delta CS \left(M^* \left(\mathfrak{F}, \mathcal{A} \right) \right) \right].$$

- **Sequence of moves:**

  1. Antitrust authority commits to approval set $\mathcal{A}$.
  2. Firms learn realization of merger possibilities.
  3. Bargaining between firms as to what merger to propose. (Offer game.)
  4. Antitrust authority approves/rejects proposed merger (if any).
  5. Cournot competition.

Analysis: Preliminaries

Lemma 1 *Suppose merger M_k is CS-neutral. Then*

1. *the merger causes no changes in the output of any nonmerging firm $i \notin \{0, k\}$ nor in the joint output of the merging firms 0 and k;*

2. *the merged firm's margin at the pre- and post-merger price $P(Q^\circ)$ equals the sum of the merging firms' pre-merger margins:*

$$P(Q^\circ) - \bar{c}_k = [P(Q^\circ) - c_0] + [P(Q^\circ) - c_k]\,; \tag{1}$$

3. *the merger is profitable for the merging firms;*

4. *the merger increases aggregate profit.*

Lemma 2 *A reduction in post-merger marginal cost* $\overline{c}_k$ *causes:*

1. *aggregate output* $Q(M_k)$ *and consumer surplus surplus* $CS(M_k)$ *to increase;*

2. *the induced change in the merging firms' bilateral profit,* $\Delta\Pi(M_k)$*, to rise.*

- There is systematic bias in firms' proposal incentives relative to interests of consumers:

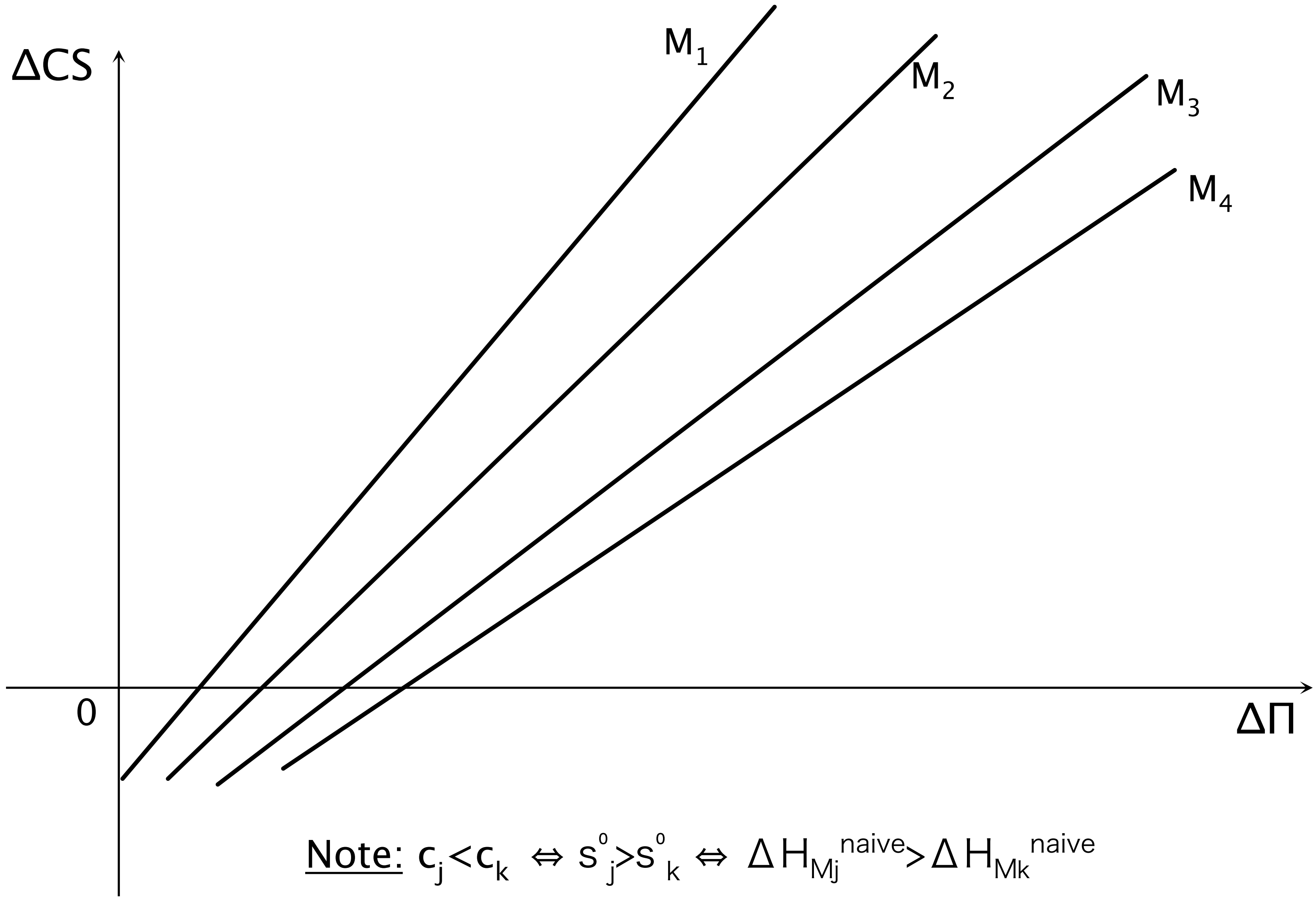
Lemma 3 *Suppose two mergers, M_j and M_k, with $k > j \geq 1$, induce the same non-negative change in consumer surplus, $\Delta CS(M_j) = \Delta CS(M_k) \geq 0$. Then the larger merger M_k induces a greater increase in the merging firms' bilateral profit: $\Delta\Pi(M_k) > \Delta\Pi(M_j) \geq 0$.*

- Idea:
  - For any CS-neutral merger M_i,

$$\Delta\Pi(M_i) = (P(Q^0) - c_0)q_i^0 + (P(Q^0) - c_i)q_0^0.$$

  - Extends to any CS-nondecreasing merger.

Can now draw a useful figure:



<u>Note:</u> $c_j < c_k \Leftrightarrow s^o_j > s^o_k \Leftrightarrow \Delta H_{Mj}^{naive} > \Delta H_{Mk}^{naive}$

(<u>Assumption 2</u>: Each merger may or may not increase CS.)

Other Bargaining Processes

Efficient Bargaining

- "Efficient" bargaining: For any realized set of feasible and approvable mergers, the firms propose the one that maximizes aggregate profit.

- Bargaining processes leading to joint profit maximization:

  1. Multilateral *Coasian bargaining* under complete information.

  2. Bernheim and Whinston (*QJE*, 1996): menu auction.

  3. Jehiel, Moldovanu and Stacchetti (*AER*, 1996): sales mechanism.

- To obtain that reduction in post-merger marginal cost increases aggregate profit (analog of Lemma 2, part (2)), one needs to impose additional structure. Holds, for instance, if pre-merger marginal cost differences are not too large.

- Analog of Lemma 3:

Lemma 3 *Suppose two mergers, M_j and M_k, with $k > j \geq 1$, induce the same non-negative change in consumer surplus, $\Delta CS(M_j) = \Delta CS(M_k) \geq 0$. Then the larger merger M_k induces a greater increase in aggregate profit.*

- Get same graph with $\Delta\Pi$ now denoting change in aggregate profit.

Main Result

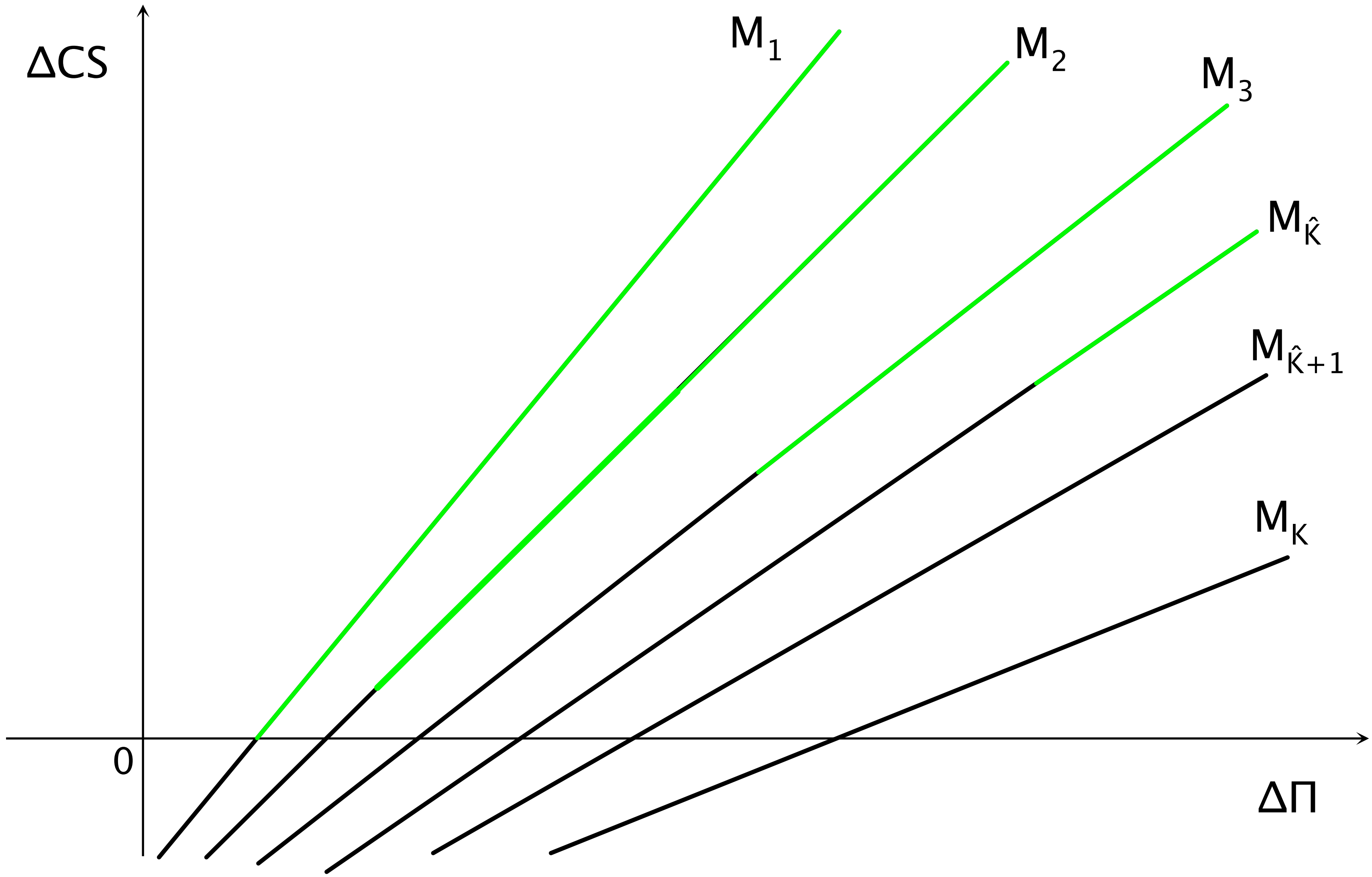
- Let:

$$\begin{aligned} \underline{\Delta CS}_k &\equiv \min\{\Delta CS(M_k) : M_k \in \mathcal{A}\} \\ \underline{\Delta \Pi}_k &\equiv \min\{\Delta \Pi(M_k) : M_k \in \mathcal{A}\} \end{aligned}$$

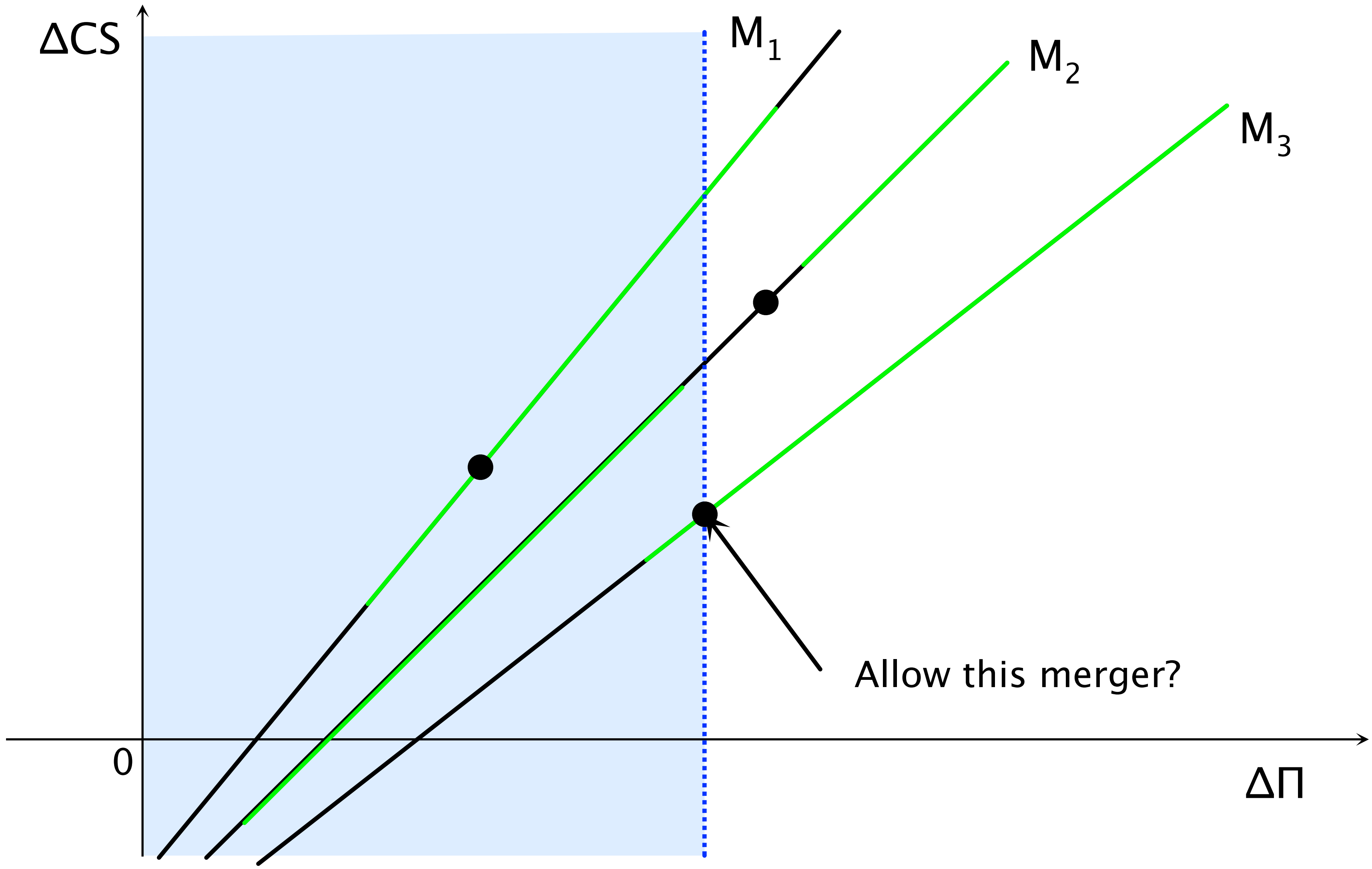
Proposition 1 *Any optimal approval policy $\mathcal{A}$ approves the smallest merger M_1 if and only if it is CS-nondecreasing, approves only mergers $\{1, ..., \widehat{K}\}$ with positive probability ($\widehat{K}$ may equal K) and satisfies:*

$$0 = \underline{\Delta CS}_1 < \underline{\Delta CS}_2 < ... < \underline{\Delta CS}_{\widehat{K}}.$$

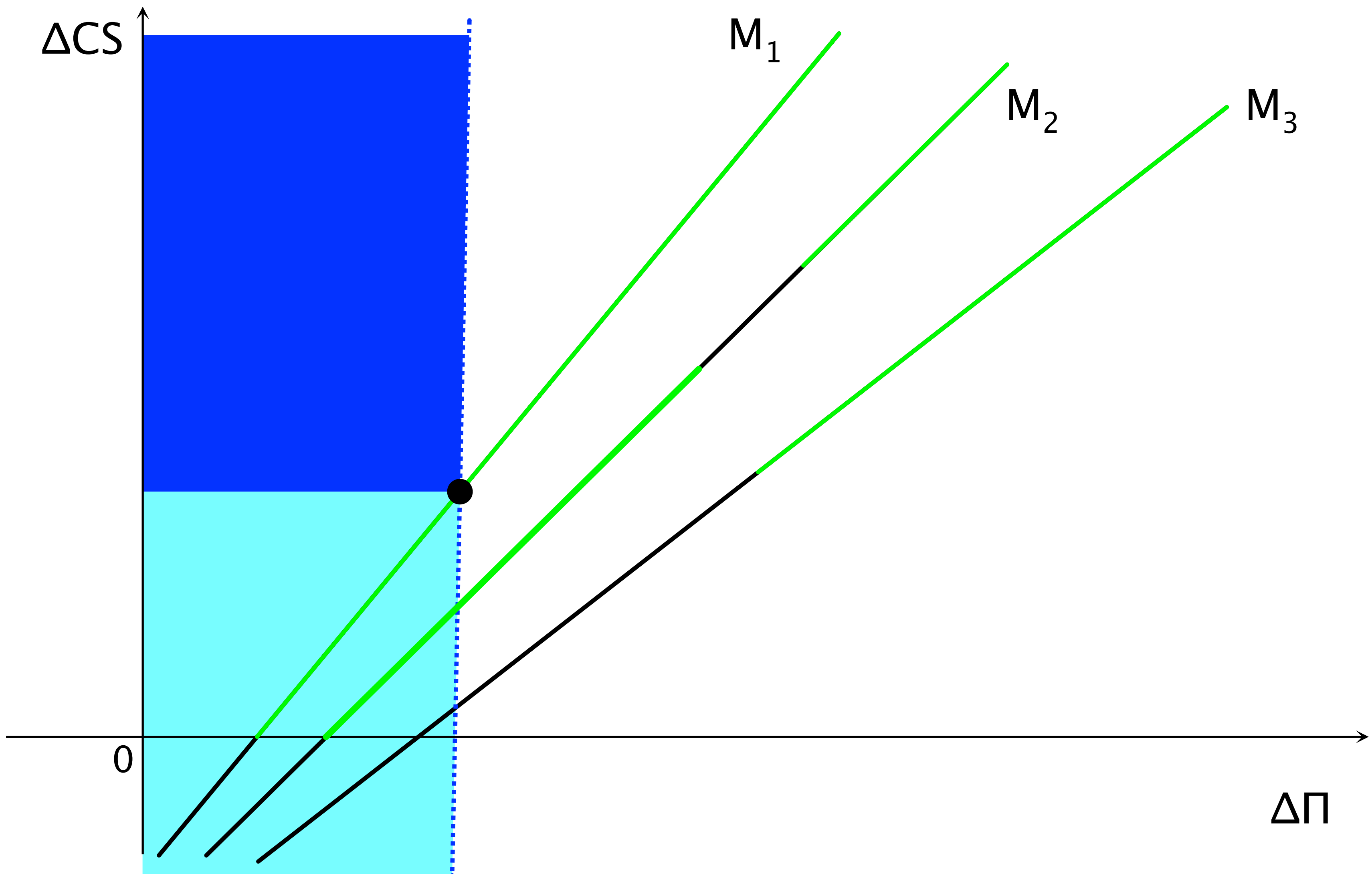
Proposition 1: The lowest allowable CS-level is increasing with merger size.



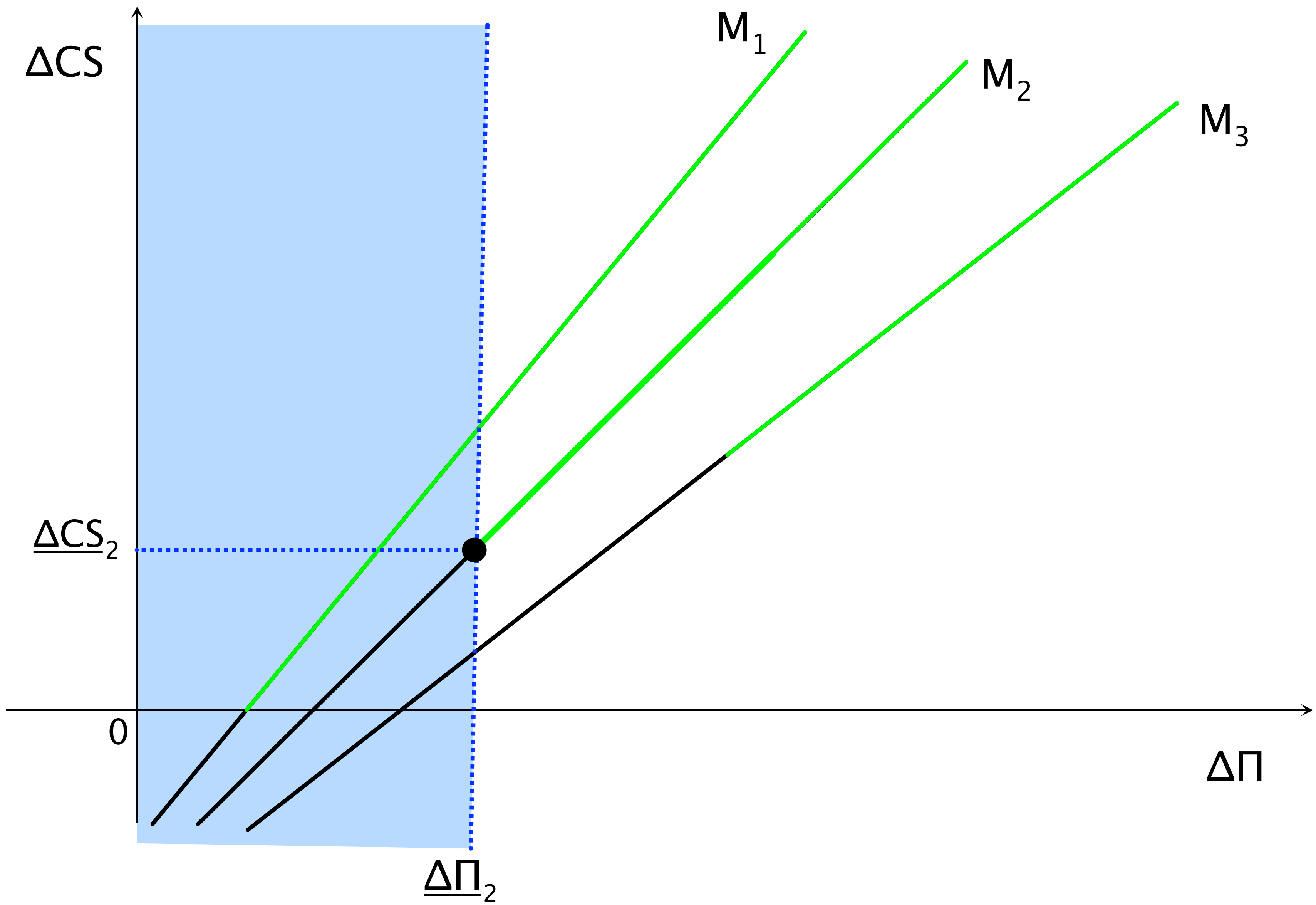
Note: Disapproval matters only when a merger is most profitable among feasible and allowable mergers.



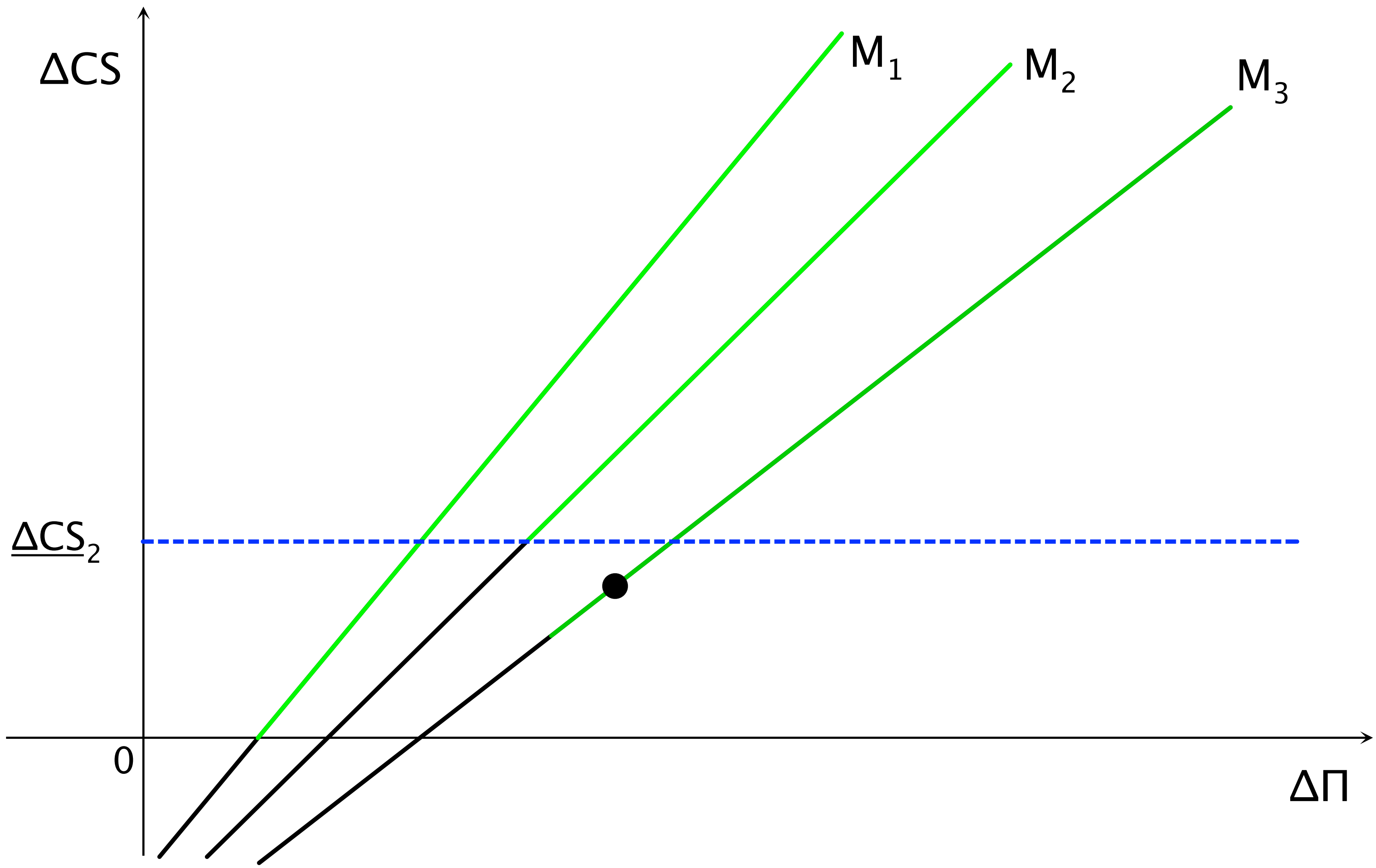
Should approve any CS-nondecreasing smallest merger (M_1).



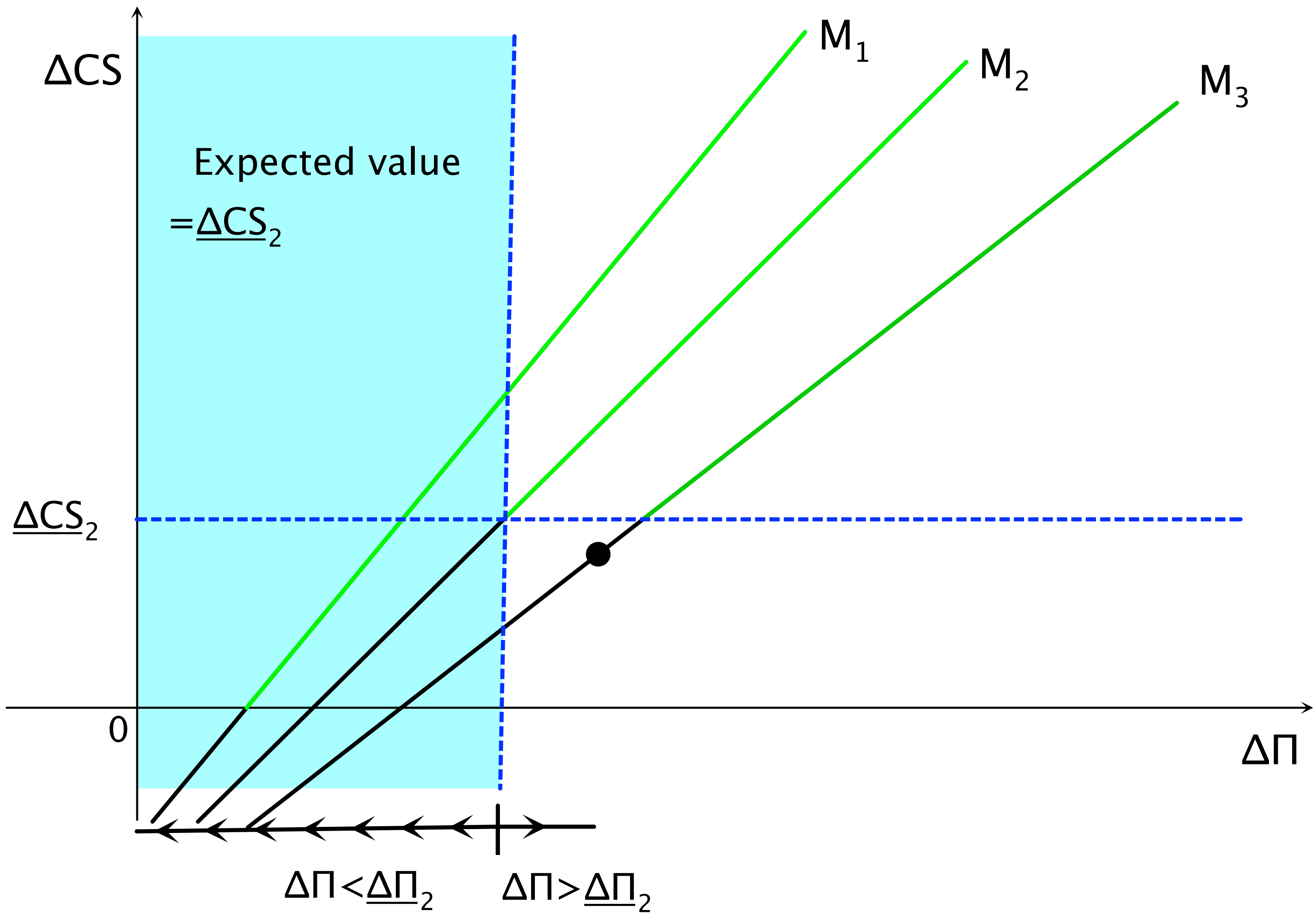
The lowest allowable CS-level for M_k, $\underline{\Delta\Pi}_k$, equals the expected CS-level of the next most profitable allowable merger.



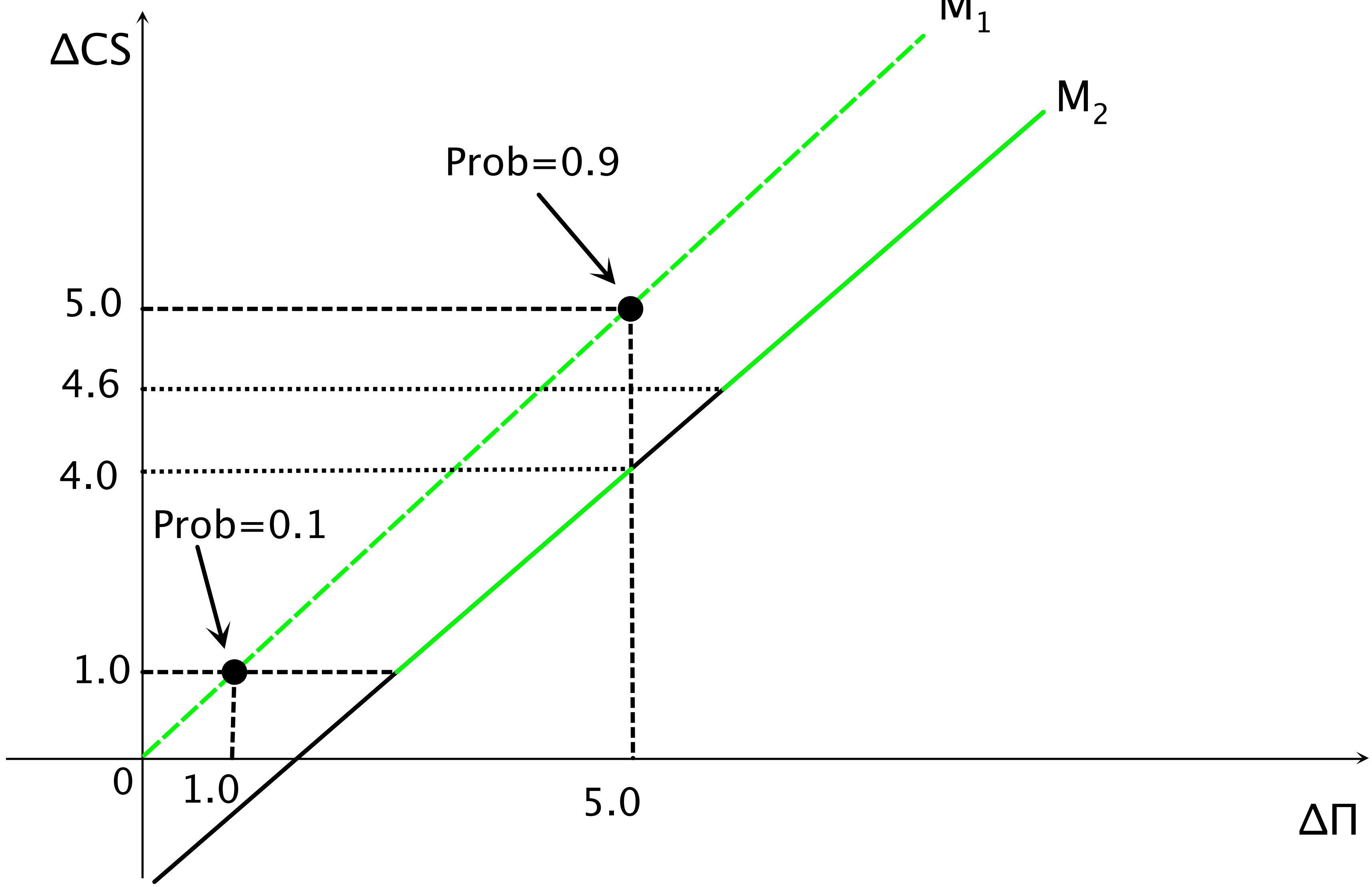
The lowest allowable CS-levels must be increasing in merger size.



Now instead reject M_3 if the change in CS less than (or equal to) $\underline{\Delta CS}_2$.



Cut-off Rules?



Extensions

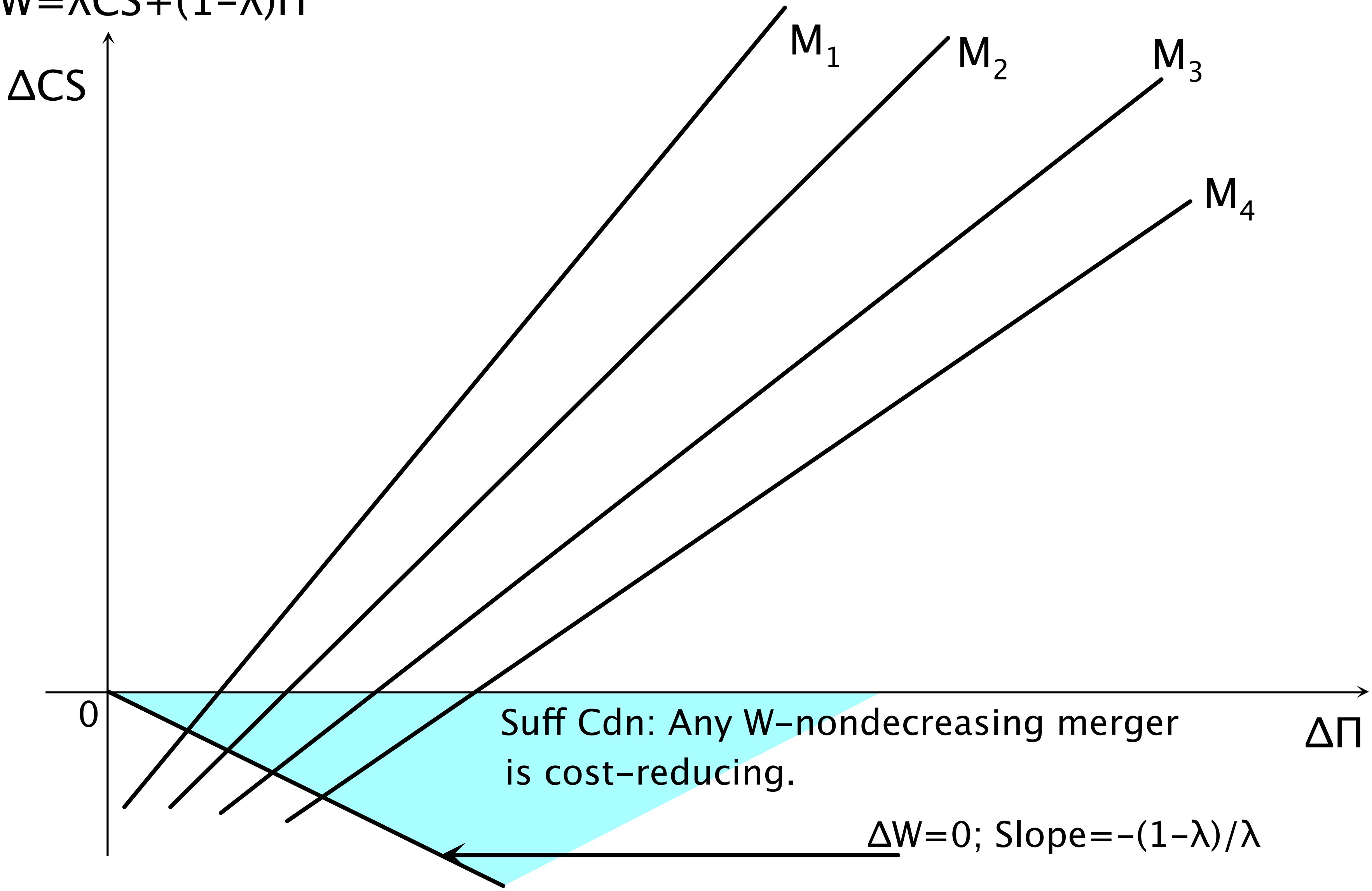
- Price competition with differentiated products.
- Alternative welfare standard.
- Fixed cost synergies.
- More general set of potential mergers.

Price Competition with Differentiated Products

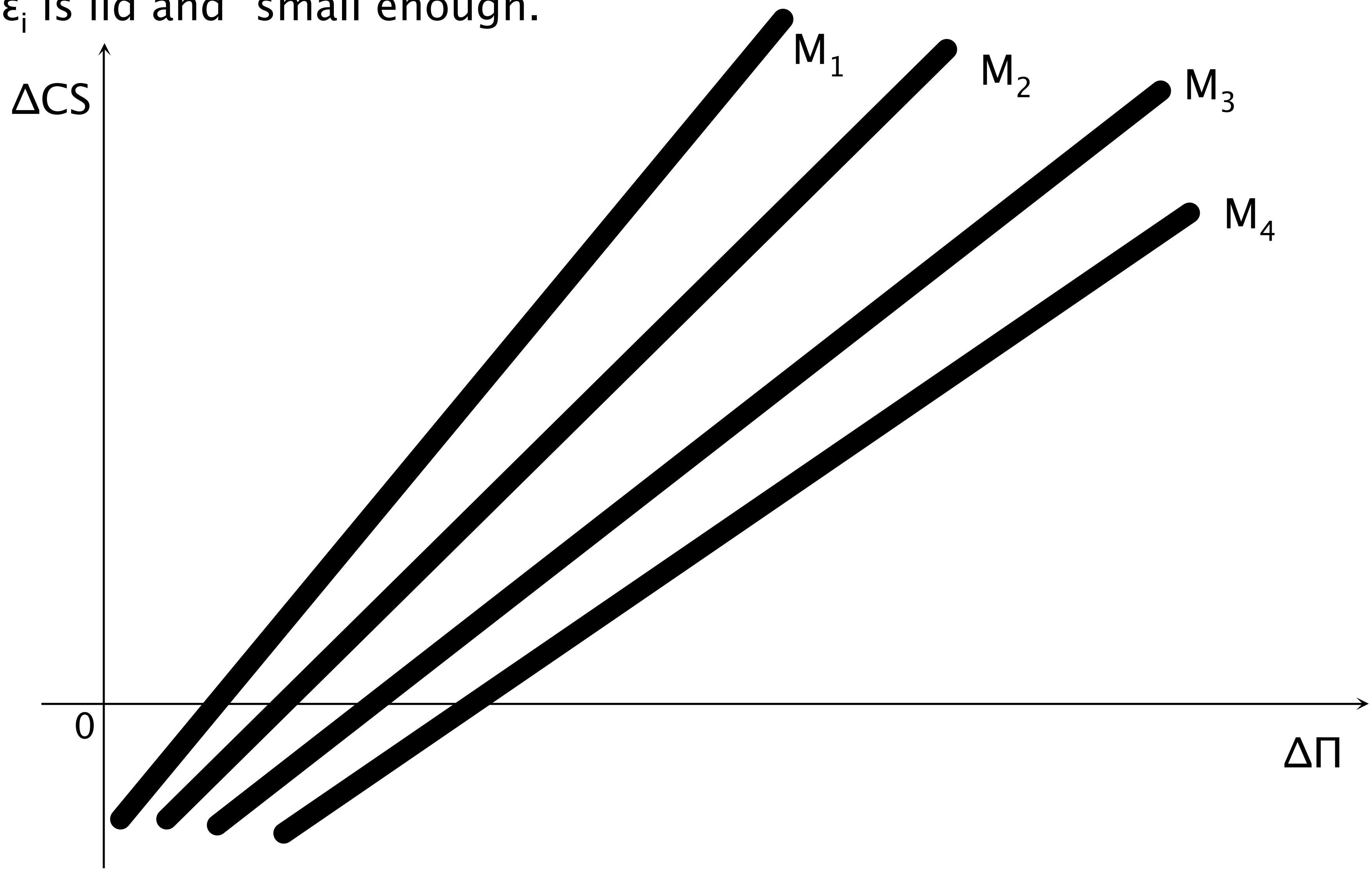
- Do our results hinge on specifics of Cournot model?
- Consider two models of price competition with differentiated products:
  - CES.
  - Multinomial logit.
- Like Cournot model, both models can be written as *aggregative games*.
- Common mathematical structure of equilibrium profit function used to show that merger curves can be ordered as before.

Alternative Welfare Standard?

$W = \lambda CS + (1-\lambda)\Pi$



Fixed Cost Synergies? Result extends if $\Delta f_i = f + \varepsilon_i$, where ε_i is iid and "small enough."



More General Set of Potential Mergers

- So far:

  1. all potential mergers involve two firms;

  2. firm 0 is part of each potential merger.

- What can we say in general (but continuing to assume that at most one merger can be proposed)?

- Key observation:

  - Conditional on being CS-neutral, induced change in aggregate profit (and, hence, in bilateral profit of merger partners) is proportional to induced change in Herfindahl index H.

  - Hence, in general, at $\Delta CS = 0$, the merger curves can be ranked on the basis of their induced change in the H.

  - But for CS-neutral mergers, this induced change in H can be *naively* computed (by pretending that post-merger market share of the merged firm is equal to sum of pre-merger market shares of the merger partners).

- Hence, provided these curves do not intersect when $\Delta CS > 0$, our main result continues to hold.

- Sufficient condition? For any $\Delta CS \geq 0$, curve of M_k is to right of that of M_j if:

  1. $\Delta H^{naive}_{M_k} > \Delta H^{naive}_{M_j}$;

  2. $\sum_{i \in M_k} s_i > \sum_{i \in M_j} s_i$;

  3. $\# M_k \leq \# M_j$.

Conclusion

- Have analyzed simple model where pivotal firm, firm 0, can choose *which* merger to propose to antitrust authority.

- Antitrust authority's optimal policy involves a higher minimum CS-standard the larger is the proposed merger.

- Analysis makes clear why discriminating between mergers on basis of naively computed post-merger Herfindahl indexes may be optimal.

- Open questions:
  - Other bargaining processes.
  - Full distribution of fixed cost synergies.
  - Correlation in synergies.

The End