

A UNIFIED FRAMEWORK FOR DYNAMIC MONOPOLY PRICING: TRADING-UP

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MOTIVATION

Point of departure

- The literature emphasizes that **Coasian dynamics** are key for understanding dynamic monopoly pricing.
- **In a nutshell:** A seller of a durable good who cannot commit to future prices lowers the prices for non-buyers over time, since high-value buyers purchase early on.

Challenge

Recent work has identified several settings in which monopoly pricing is not governed by Coasian dynamics (“**Coasian failures**”).

Questions

- (1) Why do **Coasian dynamics** arise in some (but not other) settings?
- (2) What is the “unified” **driving force** behind pricing dynamics?

Different versions of Coasian failures

- (1) **Absorbing outside option with positive value:** No dynamics, seller obtains monopoly profit (Board & Pycia 2014).
- (2) **Positive selection in a rental market:** No dynamics, seller obtains monopoly profit (Tirole 2016).
- (3) **Two durable varieties:** dynamics, but **not** to marginal cost (Nava & Schiraldi 2019).
- (4) **“Behavior-based price discrimination”:** dynamics for negatively selected types/no dynamics for positively selected types (e.g. Fudenberg & Villas-Boas 2007, Acquisti & Varian 2005, Buehler & Eschenbaum 2020).

We show

- (1) Coasian failures arise when there are no trading-up opportunities.
- (2) Trading-up drives pricing dynamics.

ANALYTICAL FRAMEWORK



Environment

A monopolist offers **two varieties** a, b over $t = 1, \dots, T$ to a single risk-neutral buyer with unit demand and private **value profile** $v = (v_a, v_b) \sim F$ on $[0, 1]^2$.

States and transitions

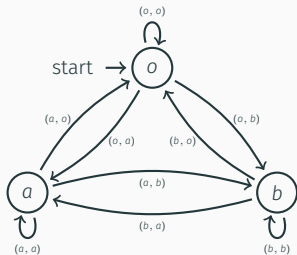
- In each period, the buyer picks a **state** $x^t \in X = \{a, b, o\}$ (i.e., variety a , variety b , or the outside option o).
- Admissible **transitions** $\Gamma \subseteq X \times X$ govern which switches are feasible.
- A state is **absorbing** (“durable”) if no other state is reachable from it; otherwise it is a **rental** variety.

Solution concept

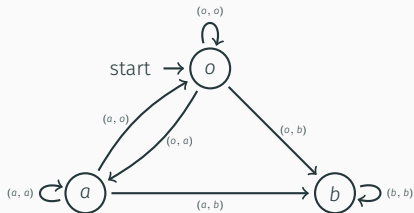
- Seller **cannot commit** to future prices $p^t = (p_a^t, p_b^t)$.
- We study **Perfect Bayesian Equilibrium** (PBE).

NESTED SETTINGS

Two rentals — goes beyond Tirole (2016)



Mixed varieties — rental a , durable b



Other special cases

- Single durable, $x^0 = o$: Coase (1972).
- Single rental, $x^0 = a$ (positive selection): Tirole (2016).
- Two durables, $x^0 = o$: Nava & Shiraldi (2019).

Definition (Trading-up opportunity)

The seller has a **trading-up opportunity** at history h^t if a positive measure of buyer types can switch to a strictly higher-valued accessible state

$$F\left(\left\{v \in V(h^t) \mid x^{t-1} \notin \arg \max_{x \in X(h^t)} v \cdot x\right\}\right) > 0.$$

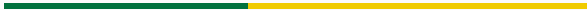
Relation to market clearing and efficiency

- **Durable** varieties: no trading-up $\iff$ market clearing.
- **Rental** varieties: no trading-up $\iff$ efficiency.
- **More generally:**
No trading-up is more (less) restrictive than market clearing (efficiency).

Key objects

- Ω : price profiles leaving **no** trading-up opportunities in the static game.
- $\bar{p} \in \Omega$: the seller's **best** profile in Ω , with profit $\pi(\bar{p})$.

RESULTS



RESULT 1: NO TRADING-UP/NO DYNAMICS

Proposition 1 (No trading-up)

If there are no trading-up opportunities at the static monopoly prices p^m (i.e., $p^m \in \Omega$), then in **any** PBE the seller can do no better than repeat p^m , earning $\Pi = \pi(p^m)\Delta$.

Intuition

- No buyer type benefits from switching to another option. Hence, the seller cannot gain from lowering future prices.
- Any short-term loss from deviating cannot be recouped later.
- Result holds **regardless of commitment ability**, and of whether varieties are **durable, rental, or mixed**.

Nests known results

- Tirole (2016): positive selection with a single rental variety.
- Here: extends to settings with **multiple** varieties.

RESULT 2: TRADING-UP/COASIAN DYNAMICS

Proposition 2 (Trading-up)

If trading-up opportunities exist at p^m , then in any PBE:

- (i) the seller trades up a positive measure of types after **every** history with trading-up opportunities;
- (ii) prices never fall below $\bar{p}$, so $\Pi \geq \pi(\bar{p})\Delta$;

Intuition

- For a seller who lacks commitment, it is profitable to trade up positive masses of types to higher-valued consumption options.
- Prices do not fall below $\bar{p}$, the most profitable prices that leave no trading-up opportunities.

EXAMPLES

TWO EXAMPLES: LINEAR SUPPORT, $T = 2$

Shared structure

- Initial state $x^0 = o$; $T = 2$ periods; each example considered for **two durables, two rentals, and mixed varieties**.

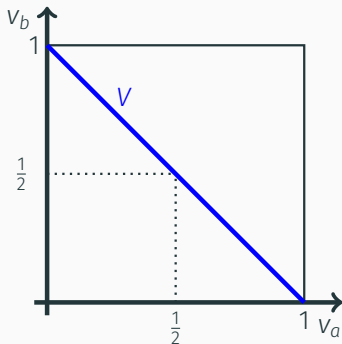
Example 1: no trading-up

- v uniform on $\{v_a + v_b = 1\}$: a “**budget line**”.
- Static monopoly prices $p^m = (\frac{1}{2}, \frac{1}{2})$ leave **no trading-up opportunities**: no dynamics (repeated static monopoly).

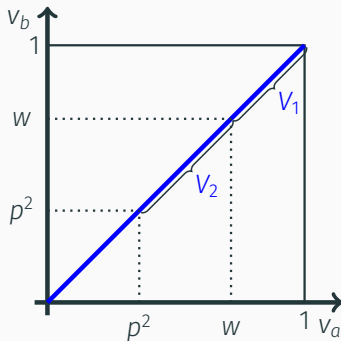
Example 2: trading-up

- v uniform on $\{v_a = v_b\}$: **perfect substitutes**.
- At static monopoly prices $p^m = (\frac{1}{2}, \frac{1}{2})$, half of the types refrain from buying: **trading-up opportunities**, and prices fall in $t = 2$.

ILLUSTRATION



Example 1: repeated static monopoly



Example 2: price dynamics, $w = \frac{2+\delta}{4+\delta}$

Note

In Example 2, types V_1 are traded up in $t = 1$, types V_2 in $t = 2$: prices fall over time as in classic Coasian dynamics (even though both varieties are offered simultaneously).

EXTENSION



TRANSITIONAL GAMES

Definition (Transitional games)

One variety is only **indirectly** accessible via another (e.g., a buyer can purchase a particular car after having leased it).

► Carvolution

Challenge

The states accessible in the static game differ from those in the dynamic game. Hence, there might be no prices that exhaust all trading-up opportunities in the static game.

Solution: Construct an extended static game

Replace the indirectly accessible variety b with a **virtual state** $\tilde{x}$, whose value is the average per-period value of the shortest path to b .

Proposition 3 (Transitional games)

If there are no trading-up opportunities in the **extended** static monopoly outcome, the seller again does no better than a monopoly strategy—up to a **one-time** price adjustment that reflects the newly accessible state.

CONCLUSION

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Summary

- (1) **Trading-up opportunities** are the unified driving force behind Coasian price dynamics across settings.
- (2) Coasian failures arise when there are no trading-up opportunities.

Key findings

- **No trading-up in static monopoly:** Static monopoly outcome repeats, regardless of commitment.
- **Trading-up opportunities:** prices fall until exhausted; profit bounded below by $\pi(\bar{p})\Delta$.

Take-away

Coase's insight generalizes: price dynamics emerge whenever **some** buyer types have access to a higher-valued consumption option—not just for non-buyers of a single durable good.

- **Endogenous choice of trade mode:**
When does the seller prefer durable, rental, or mixed varieties?
- **Long-term rental contracts with renegotiation:**
When are they equivalent to selling?
- **Competition** among sellers facing trading-up opportunities.