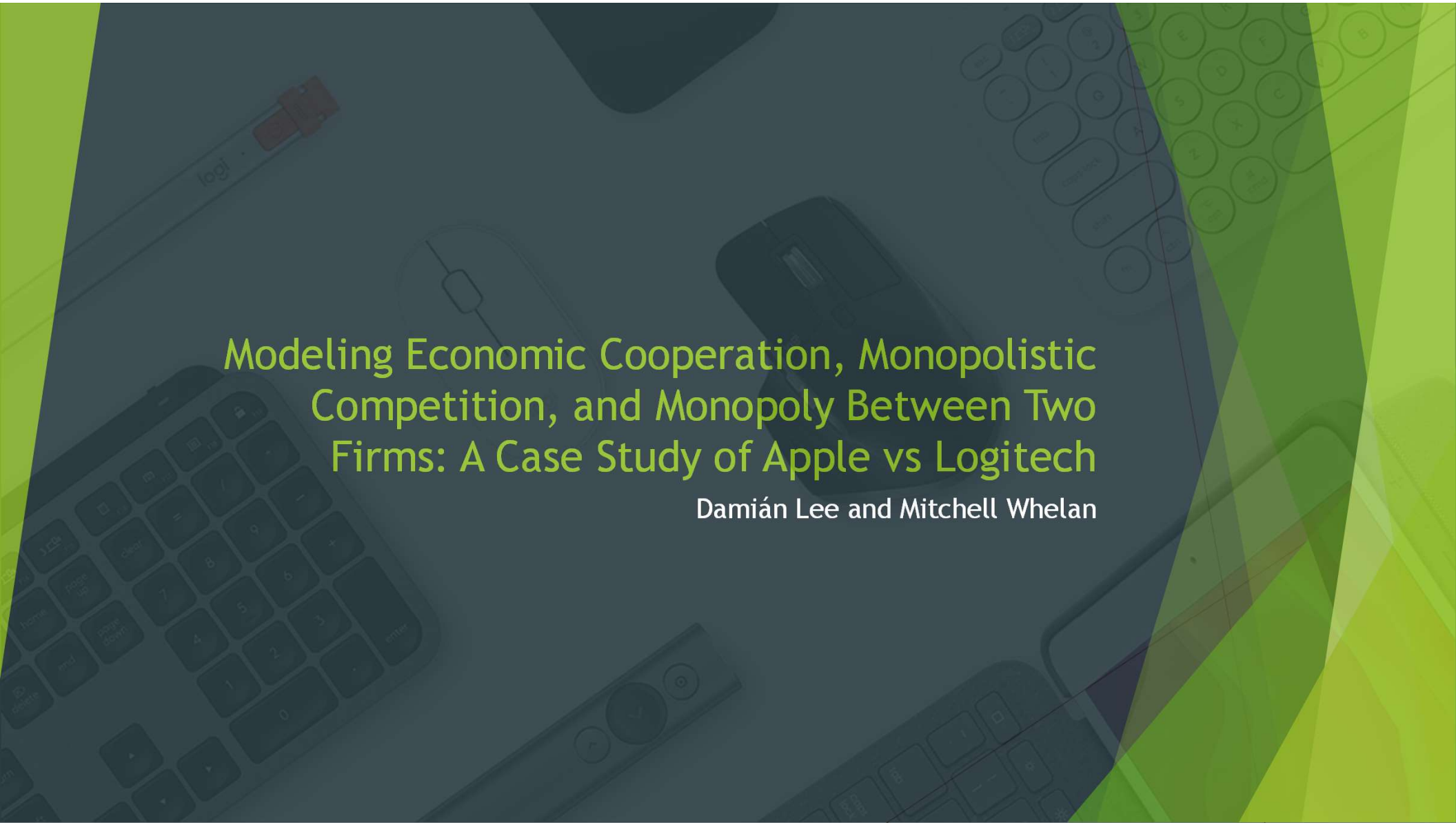

Modeling Economic Cooperation, Monopolistic Competition, and Monopoly Between Two Firms: A Case Study of Apple vs Logitech

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Introduction to Economic Cooperation

- Economic cooperation occurs when firms, industries, or nations collaborate to achieve mutual benefits, such as increased efficiency, market expansion, and innovation.
- What does cooperation look like between firms?
  - Joint Ventures: Two or more firms combine resources for a shared project.
  - Complementary Products: Firms design products that enhance each other's offerings.
  - Shared Goals: Firms align on common objectives, such as entering new markets or reducing costs.
- Potential Benefits:
  - Access to broader customer bases (market expansion)
  - Pooling expertise can accelerate product development (innovation/knowledge-sharing)
  - Shared resources can reduce duplication and costs, positively impacting profits (efficiency)
  - Partners can share risks associated with investments or new ventures (risk mitigation)

Modeling Cooperation

$$x' = x(\epsilon_1 - \delta_1 x + \alpha_1 y)$$
$$y' = y(\epsilon_2 - \delta_2 y + \alpha_2 x)$$

- x – output level or market shares of firm x
- y – output level or market shares of firm y
- ε - market demand or potential revenue for each firm
- δ – internal costs of doing business (e.g., marginal cost, self-limiting production effects, labor costs, capital available, etc.)
- α - cooperation parameter, representing joint actions like collusion to stabilize or grow mutual revenues

Economic Insights:

- Firms collude to maximize joint profitability, which leads to higher equilibrium outputs for both.
- Revenue is bounded due to market constraints (e.g., price caps or demand saturation).

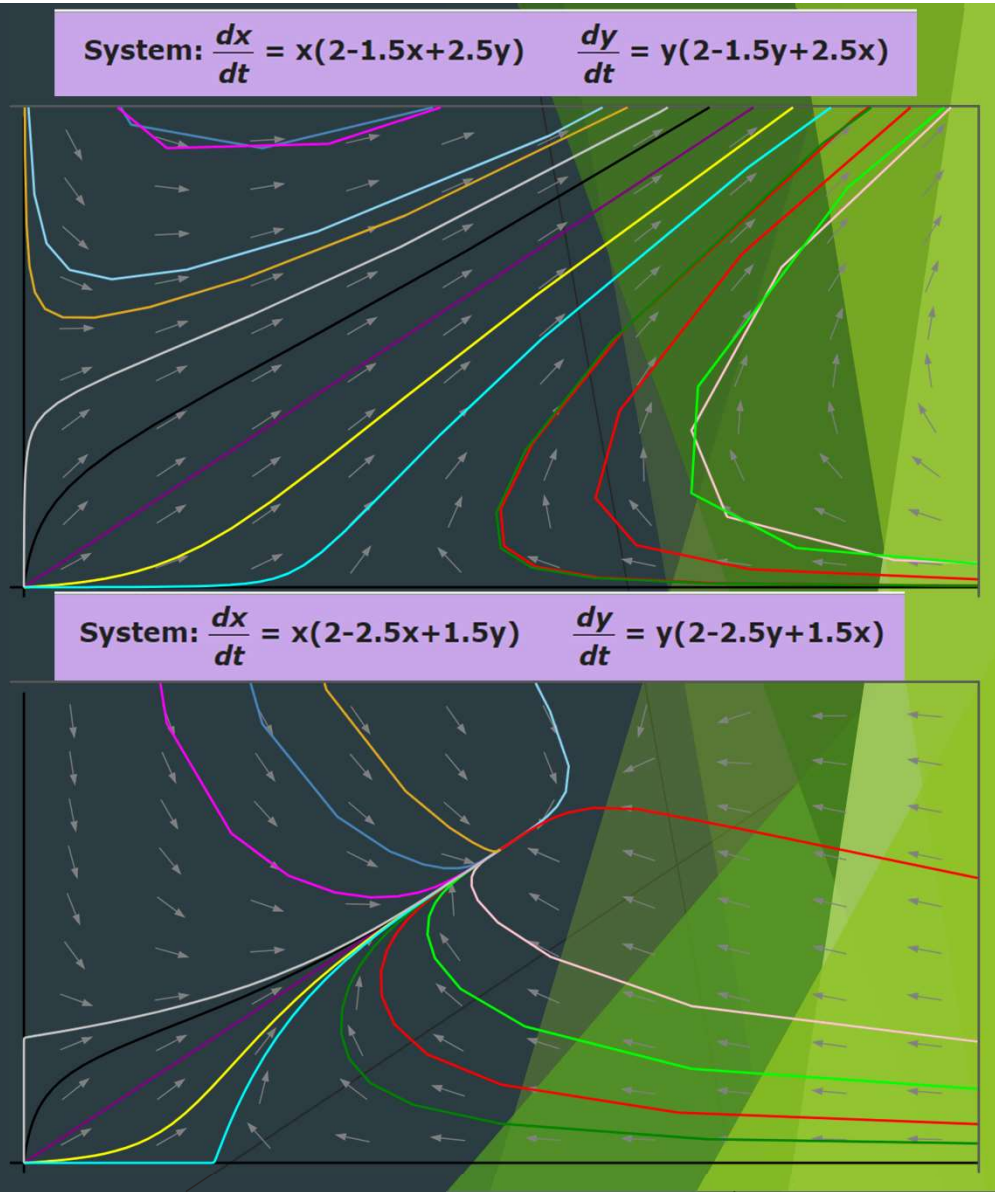
Modeling Cooperation – Apple and Logitech

Apple dominates the consumer electronic space with products like IPhones, iPads, and Macs.

Logitech specializes in computer accessories like keyboards, mice, and webcams, which complements Apple's hardware.

Cooperation in Practice

- Product Compatibility: Logitech leverages Apple's design and ecosystem by develop keyboards and mice taolored specifically for Apple's products.
- Co-Marketing: Apple and Logitech align marketing strategies promoting Logitech accessories in Apple stores as "Made for Apple" products.
- Revenue Sharing Agreement: Both firms could share revenue generated from accessories sold through Apple's distribution channels.



Introduction to Monopolistic Competition

- Monopolistic competition is a type of imperfect competition where many firms sell products that are similar but not identical.
- Combines characteristics of monopoly and perfect competition.

Key Characteristics

- Product Differentiation: Each firm offers a unique product (e.g., branding, quality, features, location, etc).
- Many Sellers: Multiple firms competing in the market.
- Free Entry and Exit: Firms can enter or exit the market with relative ease, depending on profitability.
- Non-Price Competition: Firms compete using advertising, product quality, and branding instead of just prices.

Modeling Monopolistic Competition

$$x' = x(\beta_1 - d_1 x - c_1 y)$$
$$y' = y(\beta_2 - d_2 y - c_2 x)$$

- x – output level or market share of firm x
- y – output level or market share of firm y
- ß - market demand or potential revenue for each firm; costs, profit margin, product differentiation
- d - internal costs of doing business (e.g., marginal cost, self-limiting production effects, labor costs, capital available, etc.)
- c – external competition parameter, representing cost differentiation, economies of scale, consumer demand, etc.

Modeling Competition – Apple and Logitech

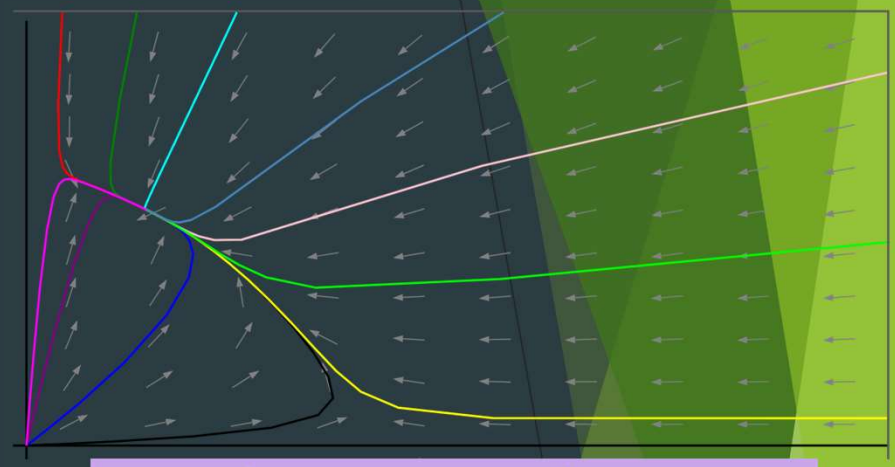
Apple differentiates itself by offering high-quality hardware with a focus on user experience and seamless integration within its ecosystem.

Logitech competes by offering a wide range of compatible accessories at various price points, catering to both Apple users and other operating systems.

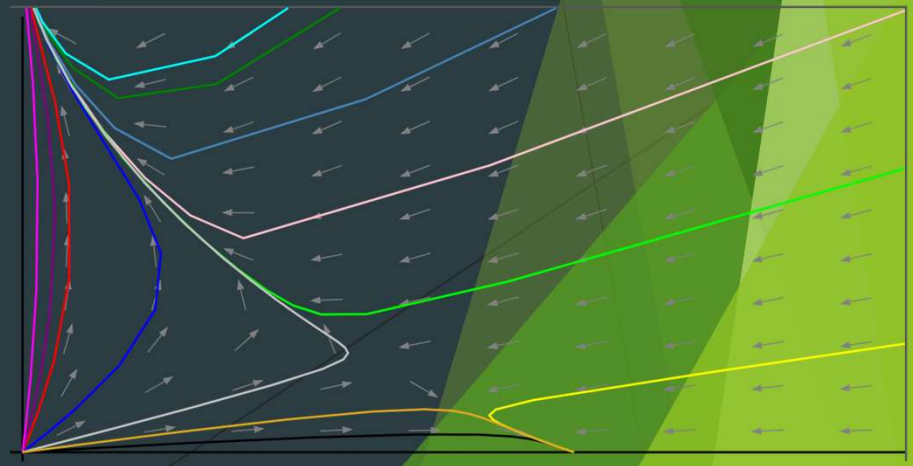
Competition in Practice

- Product Differentiation (β_1, β_2): Apple's iPads and Macs provide a unique experience with their proprietary accessories (e.g., Apple Magic Keyboard). Logitech differentiates by offering cost-effective alternatives and unique designs, such as ergonomic keyboards and accessories tailored for gaming or productivity.
- Internal Costs (d_1, d_2): Apple invests heavily in proprietary technology, increasing R&D costs (d_1). Logitech faces costs in maintaining compatibility across multiple platforms, driving d_2
- External Competition (c_1, c_2):Logitech's presence and product differentiation affects Apple's dominance in the accessories market (c_1). Apple's proprietary designs limit Logitech's potential revenue from Apple-specific products (c_2).

System: $\frac{dx}{dt} = x(10-6x-4y)$ $\frac{dy}{dt} = y(10-5y-3x)$



System: $\frac{dx}{dt} = x(10-4x-6y)$ $\frac{dy}{dt} = y(10-3y-5x)$



Introduction to Monopoly

- A monopoly is a **market structure** in which a single firm dominates the entire market, producing and selling a unique product with no close substitutes.
- The firm has **significant market power**, allowing it to set prices and control supply without facing competition.

Key Characteristics

- **Single Seller:** Only one firm supplies the entire market, making it the sole producer.
- **No Close Substitutes:** The product offered is unique, and consumers have no close alternatives.
- **High Barriers to Entry:** Significant obstacles, such as legal restrictions, high startup costs, or control of essential resources, prevent other firms from entering the market.
- **Price Maker:** The monopolist has the ability to set prices, constrained only by consumer demand.
- **Lack of Competition:** No rivals exist in the market, leading to reduced pressure for innovation or efficiency.

Modeling Monopoly

$$x' = x(\beta_1 - d_1 x)$$
$$y' = y(\beta_2 - d_2 y - c_2 x)$$

- y – output level or market share of firm y
- β - market demand or potential revenue for each firm; costs, profit margin, product differentiation
- d - internal costs of doing business – still present for each firm
- c – external competition parameter
  - **Firm X has a monopoly over the market, so it faces no external competition. Similarly, firm Y faces very high external competition because of high barriers to entry.**

Modeling Monopoly – Apple and Logitech

Apple and Logitech compete in the iPad keyboard case market, where Apple holds a quasi-monopoly due to its ecosystem control and first-party product integration, while logitech acts as a significant competitor but is constrained by Apple's dominace.

Quasi-Monopoly in Practice

- Apple's tight integration of the Magic Keyboard with iPadOS creates a natural monopoly-like advantage.
- Logitech remains competitive by offering value driven alternatives like the Combo Touch, which are typically more affordable and target price-sentative consumers.
- Apple's market dominance limits Logitech's growth because Logitech cannot offer the same level of seamless integration due to Apple's proprietary technology.
- In the short run, Apple's dominance ensures it captures a larger market share and can set premium prices, and Logitech survives by occupying a niche for budget-conscious consumers but cannnot challenge Apple's monopoly-like power directly.

System: $\frac{dx}{dt} = x(8-4x)$ $\frac{dy}{dt} = y(8-3y-5x)$