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Game Theory Term Paper

Intel and Advanced Micro Devices:
Competition in the Market of Consumer Central Processing Units

Presentation with graphics:
https://docs.google.com/presentation/d/1jueg3JnvOmQlxKW78w_fp7Z5L2CAmW77wc9YM8S8YpY/edit?usp=sharing

Intel is the largest supplier of consumer cpus; their only competitive rival being Advanced Micro Devices. Together, they are the only relevant manufacturers of 64-bit central processing units for windows-based devices. These chips have become critically ingrained in most aspects of society. Work productivity increased significantly when the personal computer was introduced to the workplace. Intel currently has an 80% market share, and AMD 20%, average aggregate supply for the most recent years. The market is extremely non-contestable. Though the market until the early 2000s was much more competitive, other semiconductor companies exited the market through mergers, acquisitions, and bankruptcies; leaving only Intel and AMD. What happened that made the market so consolidated?

My article from Joel Hruska, a freelance pc hardware industry analyst, presents a few of the many legal battles Intel has fought since 1987; the main focus being a 2005 suit that changed the course of history. In June 2005, AMD filed an antitrust lawsuit in a federal court in Delaware; suing Intel for illegally coercing 38 major desktop and laptop manufacturers (HP, Acer, Sony, Dell, etc.) to not use, or delay the use of, AMD chips in exchange for hundreds of millions total in rebates. If companies did not accept Intel's offer, the chip manufacturer threatened to give the rebates to other pc manufacturers.

This threat, as described in the court affidavits, was not cheap talk. These manufacturers had low profit margins during that time period, and any benefit given to a competitor would certainly drive market price below marginal cost. Intel, on the other hand, had a net margin of 22% (SEC). AMD noticed its share of Sony's business was 23% in 2002, but dropped to 8% in 2003, then 0 in 2005 (Hesseldahl). In 2005, AMD launched its first dual core processor, the Athlon 64 x2, with potential to capture a significant market share; Hruska points out a sharp increase in Intel's rebate payments in the first quarter of 2005. Intel owned 82% of the CPU market in 2005 (Cantrell). Intel was sued by antitrust regulators around the world. Former NYS Attorney General Andrew Cuomo released emails between former Intel CEO Paul Otellinia and a colleague bragging "(Dell operating officer Kevin Rollins is) the best friend money can buy" (Parloff).

In the European Union, where consumer harm is not required to prove market abuse, Intel was pegged down for abusing its dominant position and distorting the competitive market by cornering pc manufacturers. Intel was fined €1.06 billion in 2009; the EU's second highest court rebuked Intel's defense with a 545-page findings of fact (European Commision). The fine was set equivalent to the expected harm to EU consumers. In the US, however, AMD had to prove consumers were directly harmed by Intel's actions (Hruska). The FTC investigated, and ruled Intel used anti-competitive tactics to cut off rivals' access to the marketplace and deprive consumers of choice and innovation in the market for CPUs. Intel's defense insisted consumers had "benefited" because chip prices plunged 42% since 2000 (FTC). AMD rebuked saying: while the performance to price ratio of CPUs had become higher, this was due to Moore's law, and not specifically Intel's innovation. Ironically, Gordon Moore, who the observation is named after, is one of the cofounders of Intel; Intel did not have a good defense.

The FTC also found Intel was practicing other harmful business practices, such as not disclosing a "cripple AMD" function implemented into Intel's assembly language compilers to slow down computer chips that are not manufactured by Intel (FTC). A program compiled with Intel's would tell the CPU to process data in the slowest way it

could, especially in benchmarking software. This was easily noticeable to programmers who would hack the vendor ID of an AMD CPU to read “Genuine Intel,” and things would magically speed up a lot with very little instability (Mackey). Intel settled with AMD for $1.25 billion (FTC). The FTC Chairman, at the time Jon Leibowitz, stated “(this case) demonstrates the FTC is willing to challenge anticompetitive conduct by even the most powerful companies in the fastest-moving industries” (FTC).

The players in these games are Intel v. AMD and PC manufacturers. The game between Intel and AMD is the size of their rebates and AMD’s choice of retaliation: legal action or competitive rebates. Intel’s game with pc manufacturers is whether or not they choose to take Intel’s rebates when threatened with the possibility of a competitor gaining them, or collude to not submit to Intel.

Intel vs. AMD is of pure coordination. Intel was fairly certain AMD would respond with legal action; they had several layers of comprehensive liability insurance from a variety of companies (Kawamoto). I feel Intel’s reasoning behind an intentional lawsuit (a seemingly irrational choice) was to put down AMD’s rate of innovation, while keeping their own high, in an effort to push AMD to shut down. AMD could never out-price Intel. Every move a corporation as large as Intel makes is highly calculated by teams of attorneys -- there is no way they saw the consequences of their actions not leading to a major lawsuit. Even though this move should be considered a major risk, Intel understood there would be minimal damage to its actual business, minus the fine and patents it was required to share.

If Intel had allowed AMD’s new processor to go unchecked, it may have taken over the market at a time when AMD was appearing to catch up; My game theory leads to the conclusion Intel is risk averse. Intel has been transgressing AMD for years, and each time Intel has made major leaps in market share and company value. Each case AMD has brought against Intel leads to appeal after appeal, moving higher up in the court system, and subsequently dragging on for years; giving Intel the most important factor in research and competition: time. I feel the the equilibrium of (high rebate, no rebate) is justified by the long term strides Intel has made over AMD until recently.

I feel the market is best described as Stackelberg competition. Intel made the first move by giving out rebates, then AMD was forced to adjust its output. The equilibrium shows an 80% Intel market share, and AMD 20%.

Intel vs. PC Manufacturers is a game of assurance. Intel is sure the pc manufacturers will take the rebate, and none of them will risk a game of chicken by colluding not to take them. The equilibrium is 1000, 5. Intel would not offer such a high rebate if it were not consequential, and it understood the PC manufacturers would cave to their rules of excluding AMD.

Even now, Intel is still abusing its dominant position to keep prices high. They are currently over-engineering the chipsets for their most recent processors, and making them needlessly expensive. If you want to buy the newest budget Intel chip, the i3-8100, you need to buy an expensive z370 enthusiast level motherboard to pair it with. Most consumers of this value-oriented chip will never use its complements to their maximum ratings, and Intel is only releasing more expensive chipsets. Intel has built a strong brand with its Intel inside marketing campaign, and by rent-seeking manufacturers in to allowing them to push AMD out of the market; meanwhile, its chips are not a great value. If the market was more competitive, we may have advanced at twice the rate of innovation.

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