

Rambus v. Micron Technology, Inc., et al.

Case No. 04-431105

before

Judge Richard A. Kramer

Superior Court of the State of California

City and County of San Francisco

Declaration of Kenneth G. Elzinga

Professor of Economics

University of Virginia

January 23, 2009

I am the Robert C. Taylor Professor of Economics at the University of Virginia, where I have served on the faculty since 1967. Most of my academic career has been devoted to teaching and research in antitrust economics. I have served in the Antitrust Division of the Department of Justice at the policy level and as a testifying expert. In addition, I have been a consultant and testifying expert for the Federal Trade Commission, and on several occasions I have lectured to federal judges on antitrust economics. I served as a special consultant to Judge Lewis A. Kaplan in the Christie's-Sotheby's Auction Houses Antitrust Litigation. The Supreme Court has cited my work in antitrust economics, and I was the economic expert in three prominent antitrust cases that have been heard by the Court. I have written dozens of scholarly publications on the economics of antitrust.

I was retained in this matter by counsel for the plaintiff, Rambus Inc., to provide an economic analysis of the question of whether the defendants acted in an anticompetitive manner to relegate Rambus's computer memory technology (RDRAM) to a niche position in the marketplace.¹ After extensive analysis, I prepared and submitted an original report dated November 6, 2008 and a supplemental report dated December 19, 2008.² As explained in detail in these reports, I have concluded that, absent the collusive actions of the defendants, and assuming that RDRAM met the technical hurdles to succeed as the next generation standard, RDRAM would more likely than not have become the next generation memory technology standard.³

I make this Declaration in connection with what I understand are summary judgment motions filed by one or more defendants about some of the economic issues discussed in my reports.

One of the issues addressed in my Supplemental Report was the defendants' contention that Samsung's RDRAM output and promotional behavior are inconsistent with its participation

¹ Elzinga Report, 11/6/08, p. 5.

² I understand that my original report has already been submitted to the Court. A true copy of my December 19, 2008 Supplemental Report is attached as Appendix A.

³ Deposition of K. Elzinga, 1/12/09, pp. 139-41.

in a cartel to restrict RDRAM to niche status. As I noted in my Supplemental Report, this contention sets up a false choice for Samsung: either support RDRAM as the mainstream memory standard and expand sales of RDRAM; or participate in a cartel with other memory manufacturers to block RDRAM adoption and kill Samsung's most profitable product (and, it is implied, be behind in development of the alternative technology, DDR). This was not, however, the economic decision that Samsung faced in the real world. Instead, if Samsung joined a conspiracy to prevent RDRAM's adoption as the mainstream memory standard, the Rambus technology would not be "killed" but would be relegated to a niche product, on which Samsung could continue to earn higher profits without concern that its "competitors" would compete these profits away (as would be expected if RDRAM had become the mainstream standard with each defendant producing it).⁴

The key to understanding Samsung's place in such a cartel is recognizing that Samsung had the lead not only in RDRAM production, but also in DDR production. Under a successful cartel to limit RDRAM adoption, while Samsung loses the ability to make high-volume RDRAM sales in competition with its rivals into the future, the firm substitutes high-volume DDR sales and yet remains the dominant seller of a high-profit niche product, RDRAM.⁵ As I discuss in my Supplemental Report, the evidence shows that at least by 1999, Samsung was preparing to support both RDRAM and DDR and aimed to be the industry leader in both products. In 2001, Samsung prepared an update on the status of its DDR business, reporting that Samsung's DDR products were being validated ahead of its competitors and were fully qualified by leading chipsets. The presentation also noted that Samsung "... intends to be #1 in DDR market share." In short, Samsung was positioned to succeed no matter which memory technology was chosen.⁶

⁴ Supplemental Report of Kenneth G. Elzinga, *Rambus v. Micron Technologies, Inc., et al.*, Superior Court of the State of California, City and County of San Francisco, Case No. 04-431105, 11/6/08 ("Elzinga Supplemental Report, 12/19/08"), pp. 24-5.

⁵ Elzinga Supplemental Report, 12/19/08, p. 25.

⁶ Elzinga Supplemental Report, 12/9/08, p. 26.

Given Samsung's leading position in both RDRAM and DDR, participation in a cartel to limit RDRAM could have been expected to increase Samsung's profitability relative to a *Samsung strategy of pushing RDRAM as the main standard*. If RDRAM had become the mainstream memory standard, and there was vigorous competition among all of the memory manufacturers, it is unlikely that RDRAM would have remained as profitable for Samsung as it was when Samsung was the only major supplier. In other words, through the operation of a successful cartel to impede RDRAM and support DDR, Samsung would end up being both the predominant supplier of a high-profit niche product (RDRAM) as well as the largest supplier of the new mainstream memory product (DDR). From an economic standpoint, Samsung's participation would be rational.⁷

I also concluded from my analysis that Samsung behaved in a manner that would further a cartel to thwart RDRAM. Samsung provided its putative competitors with information about its current and planned production levels and about the firm's pricing strategy to its original equipment manufacturer (OEM) customers.⁸ For example, there is evidence that in mid-2000 Micron received information from Samsung on RDRAM prices paid by Dell, even though Micron at the time was not supplying Dell with RDRAM.⁹ There is similar evidence from the spring of 2001, after Intel had released its new Pentium 4 microprocessor for use with RDRAM. In March 2001, Mr. I.U. Kim of Samsung wrote a Toshiba executive urging him to resist Dell's demands for lower RDRAM prices and instead to offer the "same pricing" as Samsung.¹⁰ In April 2001, Mr. Kim of Samsung met with Elpida and Toshiba executives to reach an agreement on RDRAM prices: "I met GM [i.e., General Manager] of Toshiba's DRAM biz and GM of Elpida marketing yesterday and we all agreed not to drop Rambus price less than \$95 in this month."¹¹

⁷ Elzinga Supplemental Report, 12/9/08, p. 27.

⁸ Elzinga Supplemental Report, 12/9/08, p. 30.

⁹ Elzinga Supplemental Report, 12/9/08, p. 21.

¹⁰ Elzinga Supplemental Report, 12/9/08, p. 22.

¹¹ Elzinga Supplemental Report, 12/9/08, p. 22.

As described in detail in my two reports, I have concluded that Samsung's participation in a cartel that operated to thwart RDRAM is both economically rational and consistent with the evidence of inter-company communications that I have reviewed.¹²

As noted above, I also have concluded that, absent the collusive actions of the defendants, and assuming that RDRAM met the technical hurdles to succeed as the next generation standard, RDRAM would more likely than not have become the next generation memory technology standard.¹³

As explained in my initial and supplemental reports, the DRAM industry tends to adopt a single "mainstream" memory standard at any point in time, *i.e.*, a standard that makes up the majority of memory sales. Tipping toward one standard is driven in part by the steep decline in costs of manufacturing a particular technology as the manufacturer expands output and gains experience in that technology.¹⁴

Intel, as the dominant seller of computer processing units (CPUs), had a leading role in setting the industry's expectation of what the next mainstream standard technology would be.¹⁵ *Because of the prevalence of Intel CPUs, OEM customers demand memory chips that are compatible with Intel CPUs. Consequently, memory manufacturers, seeking to make sales to these OEM manufacturers, have a compelling incentive to build chips based on the memory technology that Intel chooses and for which the company designs.*¹⁶

DRAM manufacturers, if they were engaged in competition with each other, would be expected to make the products that their OEM customers wanted to buy. Any manufacturer who did not produce what its customers wanted would find itself relegated to a niche supplier. Given the current structure of the industry, this means that no single manufacturer of memory technology, of its own accord, could resist or thwart the adoption of RDRAM as a mainstream

¹² Elzinga Supplemental Report, 12/9/08, pp. 24–31.

¹³ Deposition of K. Elzinga, 1/12/09, pp. 139–41.

¹⁴ Elzinga Supplemental Report, 12/9/08, pp. 5–6.

¹⁵ Elzinga Supplemental Report, 12/9/08, p. 6.

¹⁶ Elzinga Report, 11/6/08, p. 16.

memory standard. It also means that no single memory manufacturer, of its own accord, could make RDRAM the next standard. A critical mass of supply, and therefore a number of DRAM suppliers, is needed to support a memory technology for it to be adopted as a mainstream standard.¹⁷

In light of these features of the market, the individual *preference* of any of the defendants for DDR would not translate into a unilateral incentive to *supply* DDR rather than RDRAM under the circumstances described in my original report. Rather, in the face of Intel and OEM customer demand for RDRAM, and the attending expectation of RDRAM production by their rivals, each defendant acting unilaterally would either need to build capacity to produce RDRAM or face losing market share, because each would lack the ability to produce the next generation mainstream memory standard.¹⁸

By engaging in cartel behavior, however, defendants were able to refuse to produce RDRAM in volume without the risk of losing substantial sales.¹⁹ Limits to current production also would affect future costs by depriving RDRAM of the benefits of learning by doing. As a consequence, Micron, Hynix and Infineon's failure to produce RDRAM in large quantities would be expected to lead the cost of RDRAM to remain high.²⁰

In addition, reduced production would have the effect of limiting future OEM customer demand. Computer manufacturers plan their product lines months and sometimes years ahead of time based in part on what they *believe* to be the future supply of memory. The prospect of minimal supply from Infineon, Hynix and Micron would be expected to reduce future demand for RDRAM.²¹

In the 1999-2001 time period, Intel and computer manufacturers were making critical decisions about their product roadmaps for 2002 and beyond. By 2000, it was clear that

¹⁷ Elzinga Supplemental Report, 12/9/08, p. 7.

¹⁸ Elzinga Supplemental Report, 12/9/08, p. 10.

¹⁹ Elzinga Report, 11/6/08, p. 72.

²⁰ Elzinga Report, 11/6/08, pp. 80-1.

²¹ Elzinga Report, 11/6/08, p. 81.

SDRAM had reached its performance limits and that a new high-speed DRAM (either DDR or RDRAM) would soon replace it. The defendant manufacturer group jointly controlled the price expectations (as well as the actual prices) of both RDRAM and the available alternative technologies, SDRAM and DDR, and collectively decided how to position the prices of the two products. In these critical battles for design wins, Hynix, Micron and Samsung conspired to project high RDRAM price premiums relative to SDRAM. In contrast, projected DDR price premiums over SDRAM were kept low to stimulate demand for DDR and diminish demand for RDRAM.²² Critical examples of these actions and their effects are described in Part IX of my original report.

In short, I have concluded, given the demand of Intel and the OEMs, that absent the cartel behavior described in detail in my reports, and assuming that RDRAM met the technical hurdles to succeed as the next generation standard, RDRAM would more likely than not have become the next generation memory technology standard.²³

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 23rd day of January, 2009 at Charlottesville, Virginia.


 Kenneth G. Elzinga

²² Elzinga Report, 11/6/08, pp. 81-2.

²³ Deposition of K. Elzinga, 1/12/09, p. 139-41.