DOES ANTITRUST ENFORCEMENT IN HIGH TECH MARKETS BENEFIT CONSUMERS? STOCK PRICE EVIDENCE FROM *FTC V. INTEL*

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George Mason University Law and Economics Research Paper Series

11-02

TECHNOLOGY POLICY INSTITUTE

Studying the Global Information Economy

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January 2011

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Prepared for the October 22, 2010 Conference on Antitrust and the Dynamics of Competition in "New Economy" Industries, sponsored by the Technology Policy Institute, Washington DC

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Abstract

Antitrust enforcement efforts in the United States and abroad have been ramped up in high-tech industries, rekindling stale and largely unresolved debates concerning the appropriate role of antitrust enforcement in high-tech markets. Like the previous enforcement actions against Microsoft, and likely enforcement efforts in the future against similarly situated business firms, recent enforcement efforts challenging Intel's business practices raise the same fundamental issues concerning the effectiveness of competition policy in dynamically competitive industries. While opinions and broad-sweeping assertions as to the appropriate role of antitrust in these markets are common, traditional empirical approaches have left fundamental issues unresolved. The enforcement actions against Intel, for example, have resulted in the assessment of over $3 billion in fines and consigned authority to the Federal Trade Commission to impose a variety of restrictions on Intel's pricing practices, distribution arrangements, and product design choices. But what do we know about the likely effects of these enforcement actions on consumers? Empirical evaluation of business practices in high tech-markets is incredibly complex partly because these cases involve conduct that can theoretically prove either pro-competitive or anticompetitive, because regulators must act or forbear in light of "false positives" which can chill innovation, and because distinguishing pro-competitive from anti-competitive conduct in a technologically advanced setting is particularly difficult. This paper evaluates the likely competitive effects of Intel's conduct through two approaches. The conventional approach focuses on traditional antitrust metrics in product markets: prices and output. The second, alternative approach involves turning to financial markets for valuable information. Competing antitrust economic theories can be tested against the collective wisdom of the market. In the case of Intel, where the disputed conduct in this case has been in the marketplace for nearly a decade and its competitive footprint is likely to be readily observable, this approach is especially attractive. Under either approach, the available data do not support the theory that Intel's behavior harmed consumers.

I. Introduction

Antitrust enforcement efforts in the United States and abroad have been ramped up in high-tech industries, rekindling stale and largely unresolved debates concerning the appropriate role of antitrust enforcement in high-tech markets. Like the previous enforcement actions against Microsoft, and likely enforcement efforts in the future against similarly situated business firms, recent enforcement efforts challenging Intel's business practices raise the same fundamental issues concerning the effectiveness of competition policy in dynamically competitive industries. While opinions and broad-sweeping assertions as to the appropriate role of antitrust in these markets are common, traditional empirical approaches have left fundamental issues unresolved. The enforcement actions against Intel, for example, have resulted in the assessment of over $3 billion in fines and consigned authority to the Federal Trade Commission to impose a variety of restrictions on Intel's pricing practices, distribution arrangements, and product design choices. But what do we know about the likely effects of these enforcement actions on consumers?

Intel has faced a barrage of enforcement actions. Intel's competitor AMD has filed private litigation. The European Union, South Korea, Japan, and the FTC are also pursuing actions. The highly-contested economic issues in each of these actions are twofold: first, whether loyalty discounts have plausible pro-competitive justifications; second, whether Intel's loyalty discounting scheme in specific is anticompetitive. As with all antitrust litigation, the key metric is not whether Intel's actions harmed its competitor, AMD, but whether Intel's loyalty discounts harmed *competition*. Intel has been burdened with fines, private settlements, and the FTC settlement. Sensible antitrust policy in high-tech markets must turn on the evaluation of whether enforcement efforts are welfare-increasing for consumers. The answer to this question is elusive. Empirical evaluation of business practices in high tech-markets is incredibly complex partly because these cases involve conduct that can theoretically prove either pro-competitive or anticompetitive, because regulators must act or forbear in light of "false positives" which can chill innovation, and because distinguishing pro-competitive from anti-competitive conduct in a technologically advanced setting is particularly difficult.

Innovation is critical to economic growth, and antitrust enforcement efforts that have the potential to chill innovative activity warrant special scrutiny.[1] Consumers enjoy profound benefits through low prices and novel products from companies like Intel, Google, and Apple. Antitrust policy must take account of the complex and dynamic markets within which these companies work. In Intel, for example, theoretical possibilities of anticompetitive loyalty discounts abound; pro-competitive explanations are at least equally common. Competing theories of the disputed conduct are not unique to antitrust enforcement in high-tech markets, but

[1] Geoffrey A. Manne & Joshua D. Wright, *Innovation and the Limits of Antitrust*, 6 J. COMP. L. & ECON. 153 (2010).

such cases frequently involve inherently and necessarily speculative claims concerning the potential future impact of today's business conduct on tomorrow's market structure and prices. There is, to put it mildly, no consensus on how to evaluate monopolization enforcement efforts in high-tech industries. Commentators remain poignantly divided over *Microsoft* even ten years later; there remains no consensus on whether Microsoft's challenged behavior actually proved anticompetitive.[2] In light of these competing theories, the relevant question becomes the quantum of evidence of competitive harm required to justify intervention in the face of competing, and conflicting, theories.

Perhaps the single largest antitrust intervention on a global scale since Microsoft has been the various enforcement efforts against Intel. On December 16, 2009, the Federal Trade Commission filed a complaint[3] against Intel alleging that its practices of issuing loyalty discounts in the microprocessor and graphic processor markets violated the antitrust laws. At least one interesting feature of the Intel enforcement actions, including the Commission's, was that unlike many other antitrust cases – which often require courts or enforcement agencies to speculate as to the long-run future effects of alleged anticompetitive conduct -- the discounts at issue were employed by Intel for years, obviating reliance on mere conjecture and enabling empirical testing of any alleged anticompetitive effects.

The Commission's anticompetitive theory is that Intel's loyalty discounts provide original equipment manufacturers ("OEMs") with an incentive to purchase almost all of their microprocessor and graphics processor units ("CPUs", "GPUs") from Intel. Accordingly, Intel's rivals lose sales, and are unable to achieve minimum efficient scale to compete effectively with Intel. After these rivals – chief among them AMD – are excluded, Intel is free to raise prices to recoup profits lost by the original discounts. In this framework, these discounts act as de facto "exclusive dealing" arrangements, excluding 'locked-in' OEMs from purchasing their requirements from AMD or other CPU/GPU manufacturers.

The unclear theoretical implications of most business practices in high-tech markets present several concerns. Error costs are first among these. False positives can chill innovation, the

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[2] *See generally* WILLIAM H. PAGE & JOHN E. LOPATKA, THE MICROSOFT CASE: ANTITRUST, HIGH TECHNOLOGY, AND CONSUMER WELFARE (2009); Benjamin Klein, *The Microsoft Case: What Can a Dominant Firm Do to Defend Its Market Position?*, 15 J. ECON. PERSP. 45 (2001); Michael D. Whinston, *Exclusivity and Tying in* U.S. v. Microsoft*: What We Know, and Don't Know*, 15 J. ECON. PERSP. 63 (2001); David S. Evans, Albert L. Nichols, & Richard Schmalensee, .United States v. Microsoft: *Did Consumers Win?* 1 J. COMP. L. & ECON. 497 (2005); *cf.* GARY L. REBACK, FREE THE MARKET!: WHY ONLY GOVERNMENT CAN KEEP THE MARKETPLACE COMPETITIVE (2009).

[3] Throughout the paper, we will focus on the Federal Trade Commission's complaint for simplicity, but all complaints mentioned highlighted anticompetitive concerns with loyalty discounts.

defining characteristic of both emerging markets and high-tech industries. The central question, then, is how to evaluate the likely competitive effects of intervention into high-tech markets where false positive concerns are salient.

There are two basic approaches to this problem. The first is ex post evaluation. Put simply, one can wait to see the results of the enforcement action. This approach provides limited – if any – feedback for policymakers as it is impossible to observe the critical counterfactual of how the market would have developed in the absence of the challenged intervention. Empirical evidence concerning post-intervention indicators of consumer welfare such as price, output, and innovation is similarly unreliable. Over a decade after the most important antitrust intervention in high-tech markets in US history -- the DOJ's case against Microsoft -- reasonable disagreement persists on key questions. It is unclear as to whether Microsoft's conduct harmed consumers; it is equally unclear whether the DOJ's enforcement action harmed consumers. The lack of clear answers or neutral arbiters of these questions limits policymakers. Enforcement decisions in markets where the stakes are highest must be made without adequate information.

The second approach is ex ante evaluation. Whereas ex post evaluation comes with the benefit of greater information about market outcomes after the intervention, ex ante evaluation offers the benefit of usefulness at the time of the relevant policy *decision*. The critical antitrust question is whether one can identify a neutral arbiter of the consumer welfare prospects for a particular intervention. The standard approach examines standard product market metrics: prices and output. An alternative approach turns to the financial markets to provide valuable information. Competing antitrust economic theories can be tested against the collective wisdom of the market. While financial markets may not perfectly predict the competitive consequences of all antitrust-relevant business activity or regulatory interventions, there is no doubt that so-called "event studies" harnessing this information can provide another useful tool for policymakers in an area where additional information is desperately needed.

Consider the competing economic theories of Intel's disputed conduct. These competing theories have clear, and testable, implications. Further, unlike some antitrust cases that force judges to speculate with regard to the potential competitive effects of the practices at issue, Intel's practices at the heart of the various legal disputes have persisted in the market for nearly a decade. One suspects that such practices would leave a competitive footprint. Thus, the Intel case provides a unique opportunity to test the real world impact of the contracts at issue. For example, recall that the Federal Trade Commission alleges that Intel's various rebates deprive other chip manufacturers of the opportunity to compete for distribution, thereby deterring entry and expansion by AMD and other manufacturers into the computer and graphical processor markets. This theory predicts that Intel, controlling for market trends and other important events impacting the x86 microprocessor market, should earn significant abnormal returns during the

relevant time frame as its practices allow it to maintain or increase its monopoly power. The same theory predicts that Intel's customers (such as OEMs) and firms in complementary markets should experience significant negative abnormal returns. We propose an analysis of enforcement events concerning Intel over the past decade to extract valuable information concerning the competitive consequences of Intel's conduct in the x86 microprocessor market and the market reaction to various remedies imposed against Intel (ranging from fines to the FTC settlement). With these data in hand, we can derive the market reaction to antitrust enforcement efforts against Intel, which can provide useful lessons for the future competition policy in innovative markets.

This paper proceeds in three parts. Part I explains the economics of loyalty discounts; these discounts may arise in the course of both pro-competitive as well as anticompetitive conduct. Part II presents market share data weakly suggesting that Intel's loyalty discounts were *not* anticompetitive and to the contrary, most likely increased consumer welfare. Part III turns to the alternative approach and demonstrates that AMD and Intel's stock returns are inconsistent with anticompetitive theories that Intel effectively priced AMD out of access to efficient distribution in the microprocessor market and successfully raised barriers to entry.

II. The Antitrust Economics of Loyalty Discounts

The primary anticompetitive concerns with loyalty discounts are, from an economic perspective, analytically similar to the potential harms associated with exclusive dealing contracts.[4] As is the case with exclusive dealing contracts, the potential anticompetitive concern articulated by economists,[5] and echoed by the Commission in its complaint, is that a monopolist might utilize loyalty discounts to fortify its market position, raise rivals' costs of distribution by depriving the opportunity to achieve efficient scale, and ultimately harm consumers by putting competitors out of business.

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[4] The term loyalty discount is often used in different ways both in the literature and in practice. Loyalty discounts, as used here, refer to a form of non-linear pricing in which the unit price of a good falls when the buyer meets a buyer-specific threshold requirement. See Bruce H. Kobayashi, *The Economics of Loyalty Discounts and Antitrust Law in the United States*, 1 COMP. POL'Y INT'L 115,(2005). The buyer-specific threshold distinguishes loyalty discounts from traditional volume discounts. Loyalty discounts are often associated with both all-units discounts and market-share discounts. When the buyer meets its specified threshold, an all-units discount requires that the seller give a per unit rebate to the buyer applied to all units. A market-share discount occurs if the buyer specific threshold involves a commitment from the buyer to allocate particular share of the buyer's total purchases to the seller. Another is the use of buyer specific thresholds that require a buyer to allocate a significant share of his total purchases to a single seller in order to obtain the discount or rebate. Thus, one can consider both all-units discounts and market-share discounts as a subset of loyalty discounts. *Id*. The Commission's Complaint includes allegations that both Intel's traditional volume discounts and use of loyalty discounts violated the antitrust laws. For simplicity, we will use the term loyalty discount throughout the paper to refer to the discount contracts at issue in the Federal Trade Commission's Complaint.

[5] For a discussion of these models, *see* Kobayashi, *supra* note 4.

At a recent set of hearings on antitrust analysis of exclusive dealing contracts, a sensible consensus view emerged that a necessary condition for anticompetitive harm is that the contract *actually deprives rivals of the opportunity to compete*.[6] Even then, of course, countervailing competitive benefits need to be assessed. Like other vertical contractual arrangements between manufacturers and distributors, the economic literature is replete with pro-competitive justifications for exclusive dealing and empirical evidence suggesting that vertical contractual arrangements are generally pro-competitive.[7] Assessing the appropriate application of these anticompetitive theories in any particular setting is enormously difficult, and given the empirical consensus that vertical contractual arrangements are generally pro-competitive, any such assessment must take into account the costs imposed upon consumers by erroneous antitrust intervention.

The error-cost framework counsels that the optimal antitrust regime minimizes the social costs and maximizes the social benefits of antitrust enforcement by crafting and applying rules with reference to the available empirical evidence in the context of a given business practice, subsequently moving from the empirical baseline only through careful Bayesian updating.[8] The threshold inquiry, then, is what legal and economic scholars know about the incidences of pro-competitive and anticompetitive loyalty discounts and exclusive dealing contracts. The answer is that the best available evidence suggests that vertical restraints generally, and loyalty discounts and exclusive dealing contracts specifically, are largely pro-competitive.[9]

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[6] U.S. DEPT. OF JUSTICE, COMPETITION AND MONOPOLY: SINGLE-FIRM CONDUCT UNDER SECTION 2 OF THE SHERMAN ACT 137 (2008), *available at* http://www.usdoj.gov/atr/public/reports/236681.pdf (internal citations omitted). This foreclosure remains a necessary condition and not a sufficient one. *Id*. See also Joshua D. Wright, *Antitrust Law and Competition for Distribution*, 23 Yale J. Reg. 169 (2006).

[7] *See* Francine Lafontaine & Margaret Slade, *Empirical Assessment of Exclusive Contracts*, *in* HANDBOOK OF ANTITRUST ECONOMICS (Paolo Buccirossi ed., 2008); Alden A. Abbott & Joshua D. Wright, *Antitrust Analysis of Exclusive Dealing and Tying Arrangements*, *in* ANTITRUST LAW AND ECONOMICS (Edward Elgar Publishing, 2009); James C. Cooper, Luke M. Froeb, Dan O'Brien & Michael G. Vita, *Vertical Antitrust Policy as a Problem of Inference*, 23 INT'L J. INDUS. ORG. 639 (2005); Benjamin Klein & Kevin M. Murphy, *Exclusive Dealing Intensifies Competition for Distribution*, 75 ANTITRUST L.J. 433 (2008); Daniel P. O'Brien, *The Antitrust Treatment of Vertical Restraints: Beyond the Possibility Theorems*, *in* REPORT: THE PROS AND CONS OF VERTICAL RESTRAINTS 40, 80 Konkurrensverket (Swedish Competition Authority, 2008), *available at* http://www.konkurrensverket.se/upload/Filer/Trycksaker/Rapporter/Pros&Cons/rap_pros_and_cons_vertical_restraints.pdf ;

[8] Frank H. Easterbrook, *The Limits of Antitrust*, 63 TEX L. REV. 1, 23-24 (1984).

[9] *See generally* Cooper et al., *supra* note 7, at 18 (concluding that while "some studies find evidence consistent with both pro- and anticompetitive effects . . . virtually no studies can claim to have identified instances where vertical practices were likely to have harmed competition."); Lafontaine & Slade, *supra* note 7, at 22 (" the evidence thus supports the conclusion that in these markets, manufacturer and consumer interests are apt to be aligned."). In the most recent and comprehensive survey of the literature on vertical contracting practices, O'Brien concludes that "with few exceptions, the literature does not support the view that these practices are used for anticompetitive reasons," and the evidence supports "a fairly strong prior belief that these practices are unlikely to be anticompetitive in most cases." O'Brien, *supra* note 7, at 72-73.

As loyalty discounts largely provide pro-competitive effects, we need to analyze the competitive footprint of a challenged business practice through standard monopolization analysis. Intel is a terrific case for the standard approach because the business conduct has been going on for at least a decade, allowing for extensive panel data analysis.

III. Evaluating the Case Against Intel: The Conventional Approach[10]

In recent years, Intel has faced tremendous scrutiny, including investigations or legal proceedings initiated by the Federal Trade Commission, its chief rival AMD, and international antitrust enforcement agencies. The focus of the antitrust scrutiny aimed at Intel has been the use of "loyalty discounts" offered to OEMs to carry its products. International antitrust authorities in the European Union, South Korea, Japan, as well as American counterparts at the Federal Trade Commission and the New York State Attorney General, have argued that these discount distribution contracts operate like exclusive dealing contracts, depriving rivals of the opportunity to compete for scale. The most recent complaint against Intel also alleges that Intel's loyalty discounts constitute "unfair methods of competition" within the meaning of Section 5 of the Federal Trade Commission Act.[11]

Whichever legal standard is ultimately applied to analyze loyalty discounts, under *any* test, the plaintiff bears the burden of demonstrating that the contracts harmed rivals, increased their costs, and harmed competition in the form of higher prices, reduced output, or less innovation. In the case of loyalty discounts, the thrust of the anticompetitive theory is that the contracts, like with full or partial exclusive dealing contracts, deprive rivals of the opportunity to compete for distribution sufficient to achieve minimum efficient scale.[12] In the limiting case where the threshold to receive the discount is set to 100 percent of the buyer's purchases, the practices are analytically related in the sense that the seller is compensating the buyer for exclusivity. There are, of course, valid and distinct pro-competitive and anticompetitive theories of loyalty discounts and exclusive dealing contracts.[13] The pro-competitive benefits to consumers generated by Intel's loyalty discounts are tangible, intuitive, and apparent: Intel's discounts offer OEMs lower prices which are passed on to consumers in the retail market. When OEMs offer full or partial exclusivity to competing microprocessor manufacturers, the battle between Intel

[10] We rely here in part, on our earlier analysis of the Federal Trade Commission Complaint. *See* Joshua D. Wright, *An Antitrust Analysis of the Federal Trade Commission's Complaint Against Intel*, ICLE Antitrust and Competition Policy White Paper Series (June 8, 2010), *available at*http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1624943.
[11] 15 U.S.C. § 45(a)(1) (2006).
[12] Klein & Murphy, *supra* note 7.
[13] Abbott & Wright, *supra* note 7; Klein & Murphy, *supra* note 7.

and AMD for access to consumers intensifies, leading to even greater discounts and larger gains for consumers.[14]

Intel's various rebates, the Commission alleges, deprive other chip manufacturers of the opportunity to compete for distribution, thereby deterring entry and expansion by AMD and other manufacturers into the computer and graphical processor markets. Specifically, the Commission alleges that "Intel entered into anticompetitive arrangements that were designed to limit or foreclose [manufacturers'] use of competitors' relevant products."[15] Intel allegedly punished OEMs that purchased from AMD with higher prices, while rewarding OEMs who purchased all or nearly all their requirements from Intel.[16] Intel's loyalty discounts allegedly had the effect of foreclosing competition in the microprocessor market to the detriment of consumers.[17] Collectively, the alleged impact of Intel's competitive efforts and incentives offered to OEMs to distribute Intel products was to "stall the widespread adoption of non-Intel products."[18]

Intel's loyalty discounts began in 1999; accordingly, the Commission's economic theory is empirically testable. The Commission's theory has several testable implications involving both the relevant product and financial markets. The most obvious implication of the Commission's theory is that one would expect Intel's market share to have increased and AMD's market share to have decreased since 1999. We would further expect both companies' share prices to increase and decrease respectively after Intel engaged in the complained-of contracts. Similarly, the theory predicts that AMD would not be likely to make substantial investments in future capacity because those investments could not be recouped once AMD was excluded from the marketplace. The empirical data from the product and financial markets bear out none of these implications, however, and therefore undermines the Commission's theory of liability.

The first prediction that arises out of the Commission's theory of harm is that Intel's loyalty discounts with OEMs would reduce AMD's share in the x86 microprocessor market. Figure 1 includes AMD, Intel, and VIA market shares from 1998-2009 and reveals no obvious reduction in AMD's share after Intel commenced the conduct that triggered AMD's complaint.[19]

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[14] Klein & Murphy, *supra* note 7; Wright, *supra* note 6.
[15] *In re Intel Corp., No. 9341* ¶ 6 (Fed. Trade Comm'n, Dec. 16, 2009).
[16] *Id*.
[17] *Id*. at ¶ 7.
[18] *Id*. at ¶ 11. The Commission also alleged a similar course of conduct in the GPU market. *See generally id*. at ¶ 17-19.
[19] The source data for Figure 1 is from Mercury Research.

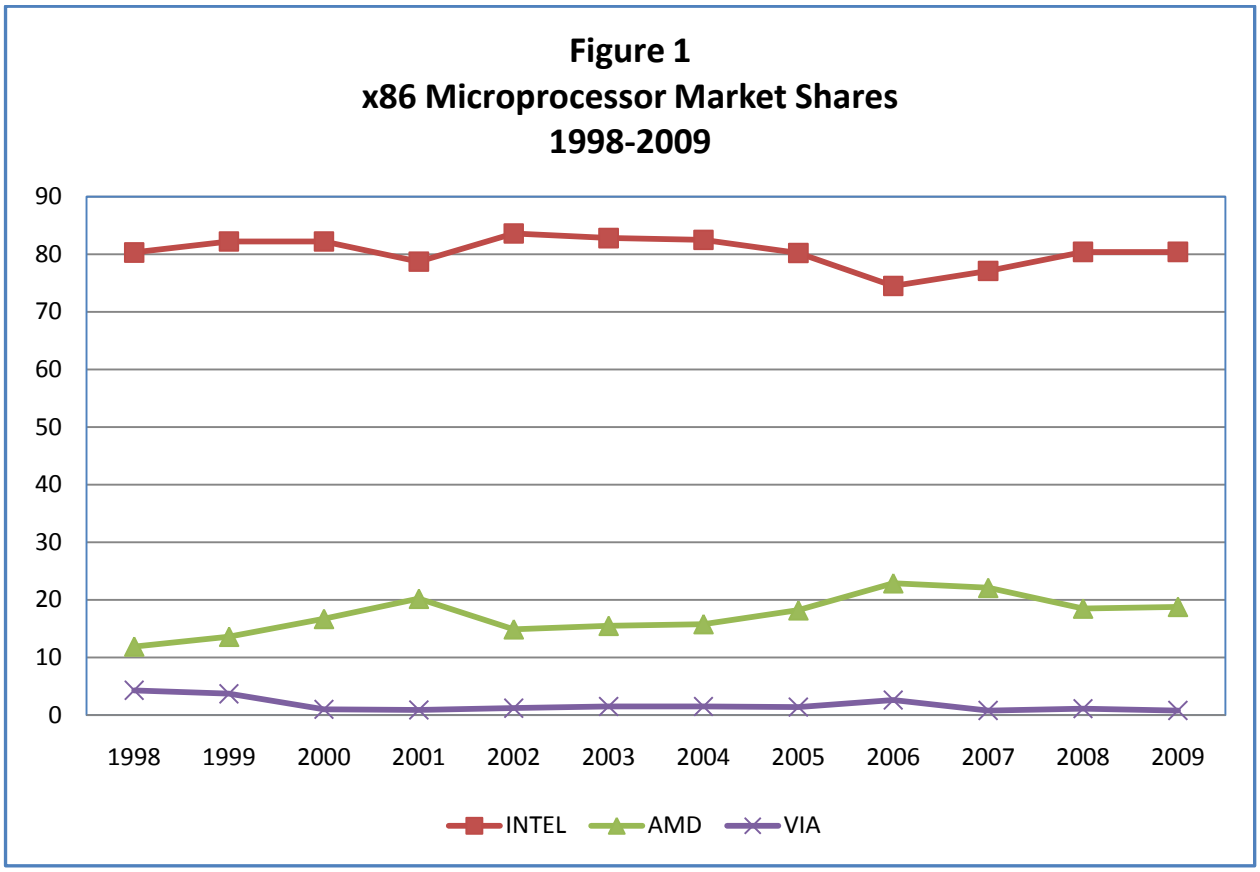
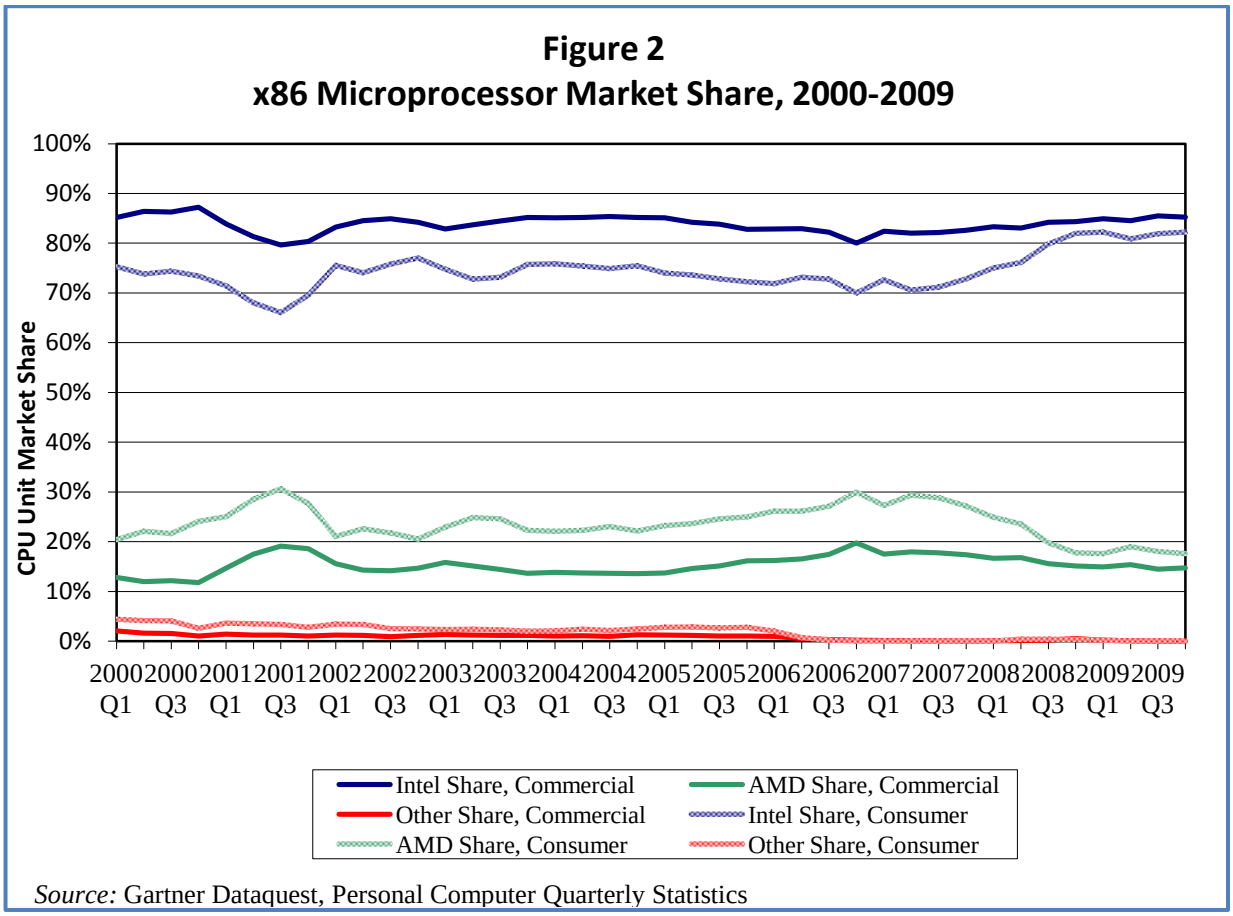


Figure 2 presents the market share data for Intel, AMD and all others by commercial and consumer segments from 2000-09.



At some level of certainty, it is impossible to disprove the Commission's theory of harm with any empirical evidence. For example, one could always hypothesize a counterfactual world in which AMD's share would have been higher but for Intel's discount contracts. Or one could argue that AMD has been able to finance overall growth even in the face of enormous competitive obstacles, but that it is unsustainable. However, the burden does not lie with Intel to disprove the Commission's theory of speculative harm or provide evidence that microprocessor prices are lower than they would have been under all other possible counterfactual scenarios. Traditional antitrust principles sensibly require exactly the opposite by burdening the plaintiff with an obligation to proffer convincing evidence of actual consumer harm. The market share data in Figures 1 and 2 plainly do not support an inference that Intel's conduct raises significant competitive concerns. Further, AMD's market share is higher in 2006 than when the conduct appeared to become a competitive issue in 1999. The only significant dip in AMD's share

appears to be after 2002 when AMD appeared to experience some technical problems which were resolved in 2003 with the launch of the 64-bit Opteron chip.[20]

A second prediction arising out of the Commission's theory of harm is that AMD's margins, sales, revenue and profits would fall as its scale decreased and costs increased. The available data are not consistent with the Commission's theory. While data are not available for the entire time period, Table 1 depicts AMD's gross margins on microprocessors from 2004-2009.[21] Contrary to the predictions of the theory, AMD's profit margins on microprocessor sales do not fall dramatically during these years. There is no evidence that Intel's distribution contracts raised AMD's costs much less had an impact on AMD's ability to compete.

Figure 3 uses alternative measures – microprocessor sales revenue and operating income by segment --- to evaluate the impact of Intel's distribution practices on its chief rival.[22] Again, the data offer no comfort to the Commission's theory. Indeed, the sales revenue data demonstrate that, contrary to claims that AMD was being deprived of scale during the relevant time period, AMD actually enjoyed a significant expansion of output. While it is difficult to precisely identify AMD's minimum efficient scale, there is little doubt that AMD's scale was increasing, and not decreasing during the relevant time period as it would be if Intel's distribution contracts were depriving AMD of the opportunity to compete on even footing for distribution.

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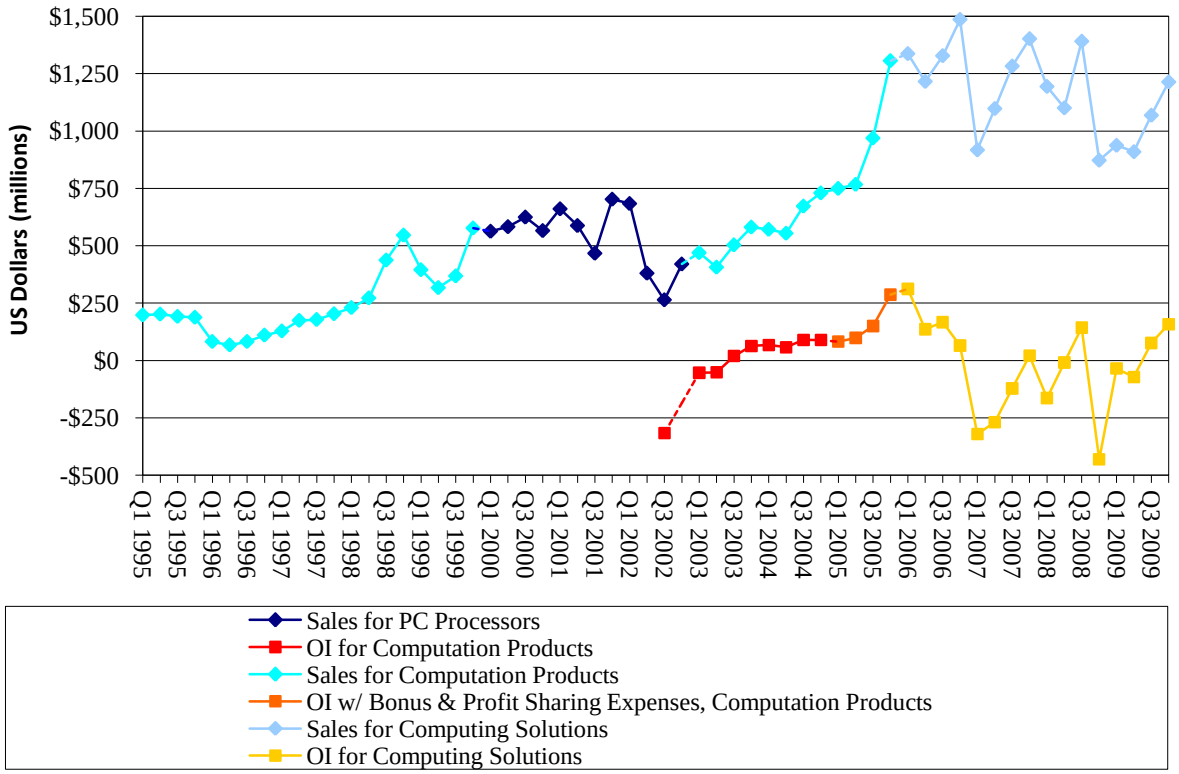
[20] Cliff Edwards, *A Weaker David to Intel's Goliath,* BUSINESS WEEK, Oct. 21, 2002, *available at* http://www.businessweek.com/print/magazine/content/02_42/b3804048.htm?tc (noting that "AMD's current chips are too slow for the higher-margin desktops PC makers are now concentrating on to boost profits, which production glitches have delayed its next-generation PC chips").

[21] *See infra* Table 1.

[22] For 1996 - Q4 1999, Computation Products (CP) sales includes microprocessor, core logic and embedded processor sales. In 1995, AMD reported corporate wide sales only; the figures here are estimated based on an annual 1995 CP % published in AMD's 1996 10K. 1995 data also includes NexGen, which AMD acquired in January 2006. For Q1 2000 - Q4 2002, PC Processor Group (PC) includes all AMD microprocessor sales. In Q3 2003, AMD regrouped chipsets and microprocessors together as CP and back reported its financial statements. Thus for Q1 2003 - Q4 2005, CP sales data are presented. In Q1 2007, AMD acquired ATI's embedded products business. The newly formed Computing Solutions includes CP and new embedded products. AMD does not report any microprocessor specific operating income (OI) until Q1 2003. Q1 2005 - Q4 2005 CP OI includes allocated bonus and profit sharing expenses. When subsequent statements present conflicting sales numbers due to organizational changes or restated results, the most recent number is used.

Figure 3
AMD Microprocessor Quarterly Sales and Operating Income, 1995 - Q4 2009



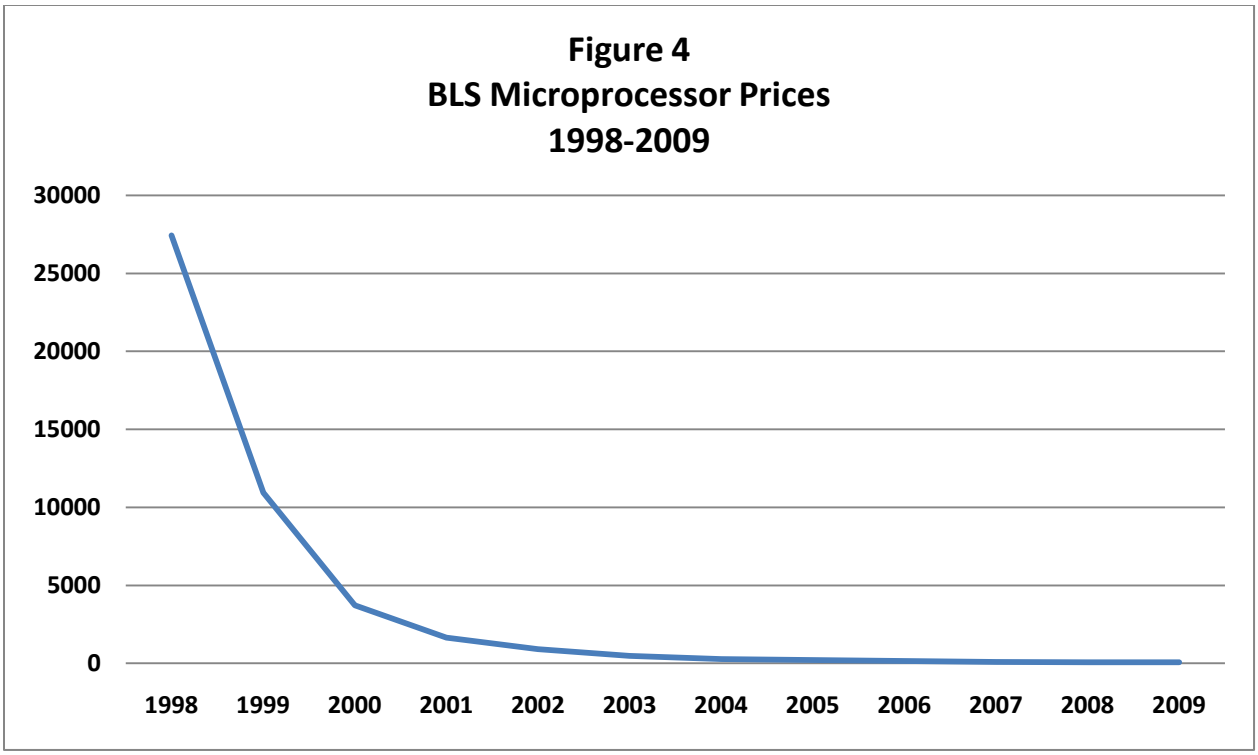
Sources: AMD Quarterly Sales and Profits, Q1 1996 - Q4 2009.

Overall, AMD's financial performance is highly variable over the relevant time period. While a comprehensive analysis of AMD's financial performance would include explaining the various dips in AMD's performance, such an effort is beyond the scope of this analysis, which is relying only on publicly available data.[23] However, the trend in AMD's financial performance during the time period in which Intel's discounts were allegedly harming AMD and microprocessor consumers is, contrary to the theory's predictions, a healthy upward trend. Again, the data offers no support for the Commission's anticompetitive theory and are consistent with vigorous competition in the microprocessor industry.

[23] For example, AMD apparently experienced a shortage of its Athlon 64 processor during an otherwise successful launch in Fall 2003. *See Athlon 61 CPUs: In Short Supply?*, PC WORLD, Sept. 24, 2003, at 1.

Of course, perhaps the most important testable implication of the Commission's theory of harm is that consumer welfare will decline as Intel's processor prices increase. While the data above suggest that the Commission's theory should be viewed with great skepticism, the downward trend in processor prices is not only difficult for the Commission to explain without invoking non-verifiable claims that prices would have fallen *even faster* but for Intel's loyalty discounts, but also highlights the error-cost problem that lies at the core of the antitrust analysis of the Commission's complaint. Figure 3 demonstrates convincingly that consumers have indeed been reaping the benefit of vigorous competition in the microprocessor market.[24] Figure 3 presents the microprocessor pricing data collected by the United States Bureau of Labor Statistics ("BLS"), and reflects quality-adjusted prices. The sharp decline in prices is impressive, with prices declining at an average rate of over 40 percent *annually* since 1999, the time period during which the Commission alleges Intel has been engaging in anticompetitive conduct. Indeed, the quality-adjusted price of microprocessors has declined more rapidly than any of the other 1,200 product categories monitored by the BLS. It is obvious these dramatically spiraling prices have generated huge gains to consumers and contradict the Commission's theory. While price indices broader than the microprocessors at issue in the Intel investigation and enforcement efforts render such data imperfect, it is implausible to suggest that these price trends, without more, support anticompetitive theories of loyalty discounts.

[24] U.S. Bureau of Labor Statistics producer price index, series identification numbers PCU33441333441312 (Microprocessors), http://data.bls.gov/cgi-bin/dsrv?pc (last visited Dec. 20, 2010).



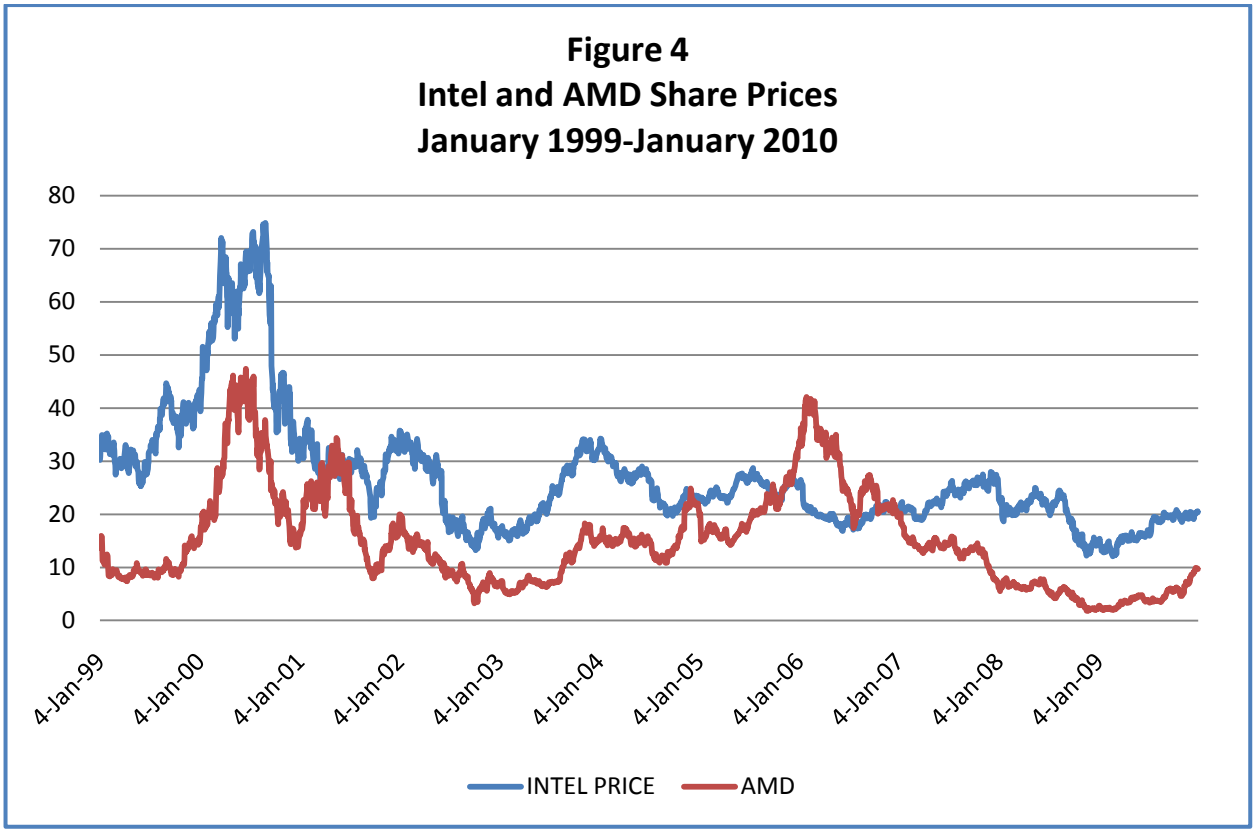
The Commission's theory predicts an increase in Intel's market share along with a corresponding decline in AMD's market share, margins, sales, and revenues. The empirical data bear out none of these implications, undermining the Commission's theory of competitive harm. The difficulty lies in identifying the appropriate counterfactual. The standard analytical method is ultimately indeterminate as one can postulate an alternate scenario where AMD's market share, margins, or profits would be higher *but for* Intel's anticompetitive conduct. This prompts an alternative method of analysis which seeks to more decisively resolve the competitive nature of Intel's practices in light of counterfactual concerns.

IV. Evaluating the Case Against Intel: An Alternative Approach

Financial markets act as information centers: they both react to and provide information. The alternative approach focuses on these financial market data to generate inferences concerning the likely competitive effects of business conduct. Competing antitrust economic theories can be tested against the collective wisdom of the financial markets as rivals and customers are impacted by antitrust events. These stock market event studies can track the relationship between, for example, allegedly anticompetitive conduct and abnormal stock returns (positive or

negative) from potential violators and victims.[25] Antitrust event studies have examined, among other things, whether horizontal mergers generate abnormal returns for customers and the impact of antitrust enforcement actions against Microsoft on returns in the computer industry.[26] While conventional product market antitrust metrics can be useful, financial market data provide an alternative source of valuable information for courts, regulators, and policymakers to evaluate a given intervention.

Figure 4 offers a different look at AMD's financial performance, relying on the financial markets to generate evidence of the effect of Intel's loyalty discount contracts on AMD.



[25] *See* B. Espen Eckbo & Peggy Wier, *Antimerger Policy under the Hart-Scott-Rodino Act: A Reexamination of the Market Power Hypothesis*, 28 J. LAW & ECON. 119 (1985); WILLIAM E. KOVACIC, THE FEDERAL TRADE COMMISSION AT 100: INTO OUR 2ND CENTURY 159-60 (2009); George Bittlingmayer & Thomas Hazlett, *DOS* Kapital*: Has Antitrust Action against Microsoft Created Valued in the Computer Industry?* 55 J. FIN. ECON. 329 (2000) (finding "compelling evidence against the joint hypothesis that Microsoft's conduct is anticompetitive and antitrust policy enforcement produces net efficiency gains"); *cf.* Gregory J. Werden, *The Role of Stock Market Studies in Formulating Antitrust Policy toward Horizontal Mergers*, 28 Q. J. BUS. & ECON. 39 (1989) (arguing that stock market event studies are not reliable).

[26] *Id.*

A visual inspection of Figure 4 reveals that AMD appears to have experienced significant gains in the financial markets from 2001-2002 to 2006, a lengthy period of time during which Intel was actively engaged in the conduct forming the basis of the Commission's complaint. If Intel's distribution contracts with OEMs were likely to produce competitive harm by depriving AMD of scale, thereby allowing Intel to increase market power, one would expect to see a dramatic decline in AMD's share price coupled with an increase in Intel's reflecting the gains from its newfound pricing power. Figure 4 offers no support for the Commission's theory, but is consistent with the pro-competitive interpretation that factors unrelated to Intel's distribution practices are the primary determinants of the relative financial performance of both firms.

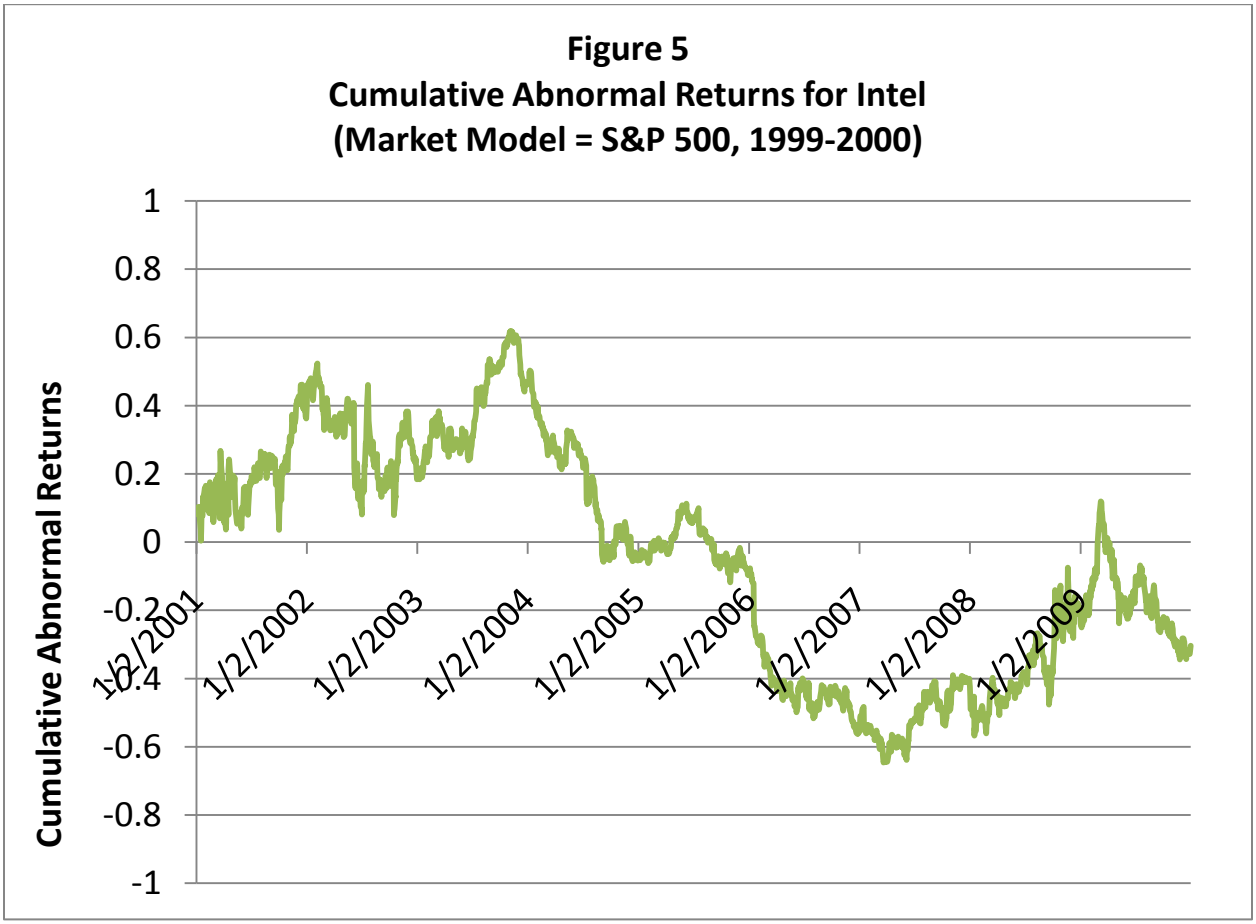
Note the decline in AMD's more recent financial performance after 2006. One might be tempted to argue that this recent decline is attributable to Intel's contracts. However, such an inference would require a strained interpretation of the available evidence. The anticompetitive theory predicts that Intel's contracts deprived AMD of profitable access to the market since at least 1999 and predicts a steady decline in AMD's performance. However, there is little evidence that AMD was deprived of profitable access to the market during the substantial majority of this time period. The mere fact that AMD experienced some expected variation in financial performance cannot be presumptively attributed to Intel without persuasive evidence. Indeed, alternative explanations for AMD's financial performance in recent years are much more plausible. For example, AMD's marketplace troubles in 2007 included botched releases of its Barcelona and ATI products and a design flaw in the Barcelona "quad-core" product which impacted both delivery timing and performance.[27]

The share price data in Figure 4, while probative, do not control for general trends in the market applying to both firms and thus leave open the possibility that despite the fall in Intel's share price, it was earning significant monopoly rents. Figures 5 and 6 account for this possibility by calculating cumulative abnormal returns earned by Intel and AMD, respectively, during the post-1999 period over which the Commission's complaint alleges Intel engaged in anticompetitive conduct.[28] While a full event study analysis explaining the variation in Intel and AMD abnormal returns over this time period is beyond the scope of this article, evaluating cumulative abnormal returns provides further evidence concerning the competitive consequences of Intel's loyalty discounts. These data illustrate the abnormal returns, that is -- those above and beyond those predictably earned by the market as a whole, from buying and holding the asset over the relevant

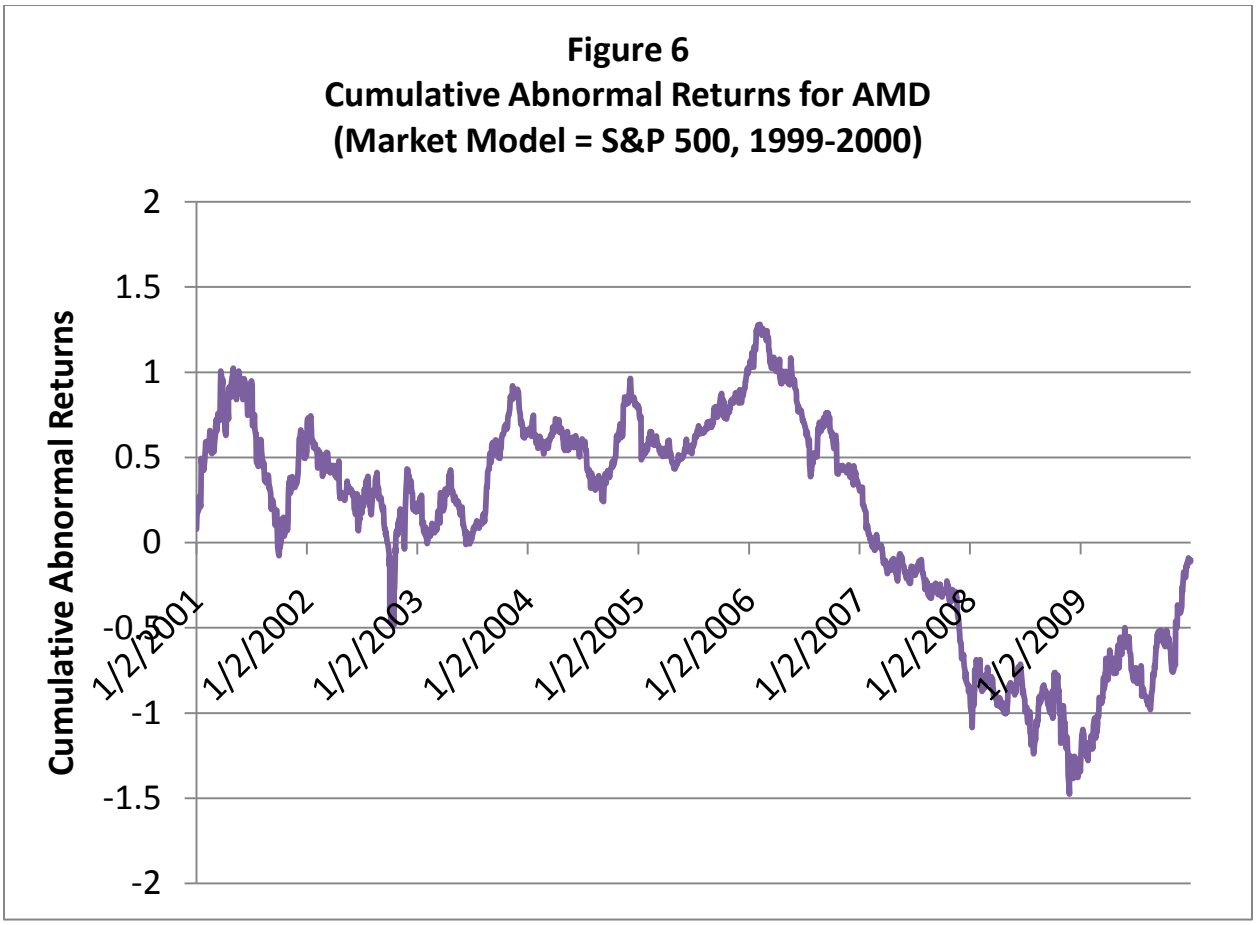
[27] *AMD Hit By Losses Across All Divisions*, MSN MONEYCENTRAL, Dec. 12, 2007. Importantly, AMD experienced these losses during a time period when it was able to gain Toshiba as a customer and expand distribution.

[28] Cumulative abnormal returns are calculated with a market model, based on the 1010 trading days between January 3, 1995 and December 31, 1998, prior to the year in which the Commission alleges anticompetitive conduct began. The abnormal return on any given day is the residual of Intel's actual return less the predicted return of the market model.

time period. If the Commission's theory is correct, Intel would accumulate significant abnormal returns over the decade long era of anticompetitive conduct. As Figures 5 and 6 demonstrate, this has simply not been the case. Intel's cumulative abnormal returns even trend slightly downward over the relevant time period. Further, even during the post-2006 time period in which AMD's share price has fallen more dramatically, there is no observable upward trend in Intel's abnormal returns. These data cast significant doubt over the Commission's prediction that Intel's conduct generated monopoly rents over this decade long period.



The data tell a similar story about the competitive effects of Intel's conduct during the relevant time period on AMD. Recall again, that the anticompetitive theory suggests that Intel's decade long use of loyalty discounts and other tactics would prevent AMD from efficiently distributing its microprocessors.



It is important to distinguish between two alternative propositions about the link between Intel's conduct and AMD's financial performance. The first is that Intel's loyalty discounts have shifted sales away from AMD toward Intel, reducing AMD's sales or revenues, but improving consumer welfare. The second is that Intel's loyalty discounts prevented AMD from competing for access to distribution, deprived AMD from achieving minimum efficient scale, and increased Intel's monopoly power. Only the second set of propositions is of antitrust concern. The well known antitrust maxim that harm to competitors is not sufficient to establish harm to competition fits well here. While the evidence presented above is not consistent with the Commission's theory because the theory implies that Intel's loyalty discounts would cause significant harm to AMD, even if it were present, evidence of harm to a competitor is merely a necessary condition and not sufficient to establish an antitrust violation without further proof of harm to competition.

Taken collectively, the data above do not support the second proposition and do little other than to paint a picture of a highly competitive market characterized by vigorous competition for distribution. Moreover, there is another significant piece of evidence that is difficult to reconcile with the second proposition: AMD's substantial investments into research and development and expanded capacity during the relevant time frame. For example, in October 2005, AMD announced the opening of Fab 36 in Dresden, Germany, and expected to invest a total of $2.5 billion in this facility by November 2007.[29] It has also been reported that AMD has made substantial investments into converting its existing Fab 30 from the 130-nm process to the 90-nm process.[30] The evidence appears to support the view that AMD is able to sell all of the chips that it is able to produce and AMD's capacity, not Intel's conduct, constrained AMD. If AMD is successfully selling all of the chips it can produce, and capacity constraints unrelated to Intel's conduct are the binding constraint on AMD's production, such evidence would be inconsistent with the Commission's theory. Moreover, if AMD *believed* that Intel's conduct was leading inexorably to AMD's demise it would be unlikely to make such substantial up-front investments with the expectation of future returns.

The portrait of the competitive landscape in the microprocessor market that emerges is difficult to reconcile with the Commission's theory of harm. AMD's performance in the relevant product market and in the financial markets is not consistent with the Commission's theory Intel's prices have fallen dramatically, and AMD has made significant investments into expanding capacity. Collectively, the data support the view that Intel and AMD have engaged in an intense rivalry that has resulted in substantial benefits for consumers. On the merits, it appears that the most likely outcome of the Commission's prosecution will be to deter further pro-competitive conduct in a dynamic and innovative market at a time when economic growth is of utmost importance to the U.S. recovery from its current financial woes.

V. Conclusion

Innovation is critical to economic growth. Incentives to innovate are at the heart of the antitrust enterprise in dynamically competitive industries and thus, getting antitrust policy right in high-tech markets is an increasingly important component of regulatory policy in the modern economy. While antitrust enforcement *activity* in high-tech markets in the United States and the rest of the world is ever-increasing, there remain significant disputes as to how to assess intervention in dynamically competitive markets. First order questions remain unanswered in stale debates over the appropriate role of competition policy in these markets. Traditional

[29] Press Release, AMD Corp., AMD Opens New 300mm Fab 36 in Dresden, Germany, Continuing its Track Record of Flawless Manufacturing Strategy Execution (Oct. 14, 2005).
[30] Press Release, AMD Corp., AMD Reports Second Quarter Results (July 14, 2004), (*available at* http://www.amd.com/us-en/Corporate/AboutAMD/0,,51_52_1991~87558,00.html.)

antitrust metrics such as prices and output are valuable tools for figuring out the competitive effects of complex business conduct in high-tech markets. However, empirical evaluation of business practices in high tech-markets is incredibly complex partly because these cases involve conduct that can theoretically prove either pro-competitive or anticompetitive, because regulators must act or forbear in light of "false positives" which can chill innovation, and because distinguishing pro-competitive from anti-competitive conduct in a technologically advanced setting is particularly difficult.

Reliance on stock price data, and in particular, evaluation of abnormal returns provides an additional source of information to shed light on these vexing questions. We examine the financial market data and its implications for understanding the likely competitive effects of the various enforcement actions against Intel. Like most enforcement actions, especially those in high-tech markets, the actions against Intel involved complex analysis. There are many theoretical arguments concerning possible competitive effects of these contracts. Further, the potential for innovation-chilling error costs must be accounted for in any ex ante cost-benefit analysis of intervention. The ten year period in which Intel was engaged in the business practices at issue provide an excellent opportunity to evaluate the competitive footprint of those practices using both the traditional and financial market approaches. While both traditional and financial market approaches are necessarily indeterminate in the sense that AMD could have done *even* better but for Intel's loyalty discounting, it is the plaintiff's burden to demonstrate that Intel's conduct harmed competition and ultimately, consumers. We conclude that, under either approach, the data do not support the theory that Intel's behavior harmed consumers.

Table 1
AMD Microprocessor Gross Margins, Q1 2004 - Q4 2009

Quarter	AMD Microprocessor[1] Gross Margin	Sources
Q1 2004	51.2%	[a], [b]
Q2 2004	52.4%	[a], [c]
Q3 2004	52.1%	[a]
Q4 2004	50.0%	[d]
Q1 2005	52.7%	[e]
Q2 2005	58.0%	[i]
Q3 2005	55.4%	[g]
Q4 2005	57.3%	[e]
Q1 2006	58.5%	[f]
Q2 2006	56.8%	[f]
Q3 2006	52.0%	[h]
Q4 2006	45.2%	[e], [f], [h], [j], [l], [m], [n]
Q1 2007	35.6%	[e], [f], [h], [j], [l], [m], [n], [k]
Q2 2007	37.9%	[e], [f], [h], [j], [l], [m], [n], [k]
Q3 2007	46.0%	[e], [f], [h], [j], [l], [m], [n], [o]
Q4 2007	49.2%	[e], [f], [h], [j], [l], [m], [n], [p]
Q1	46.9%	[e], [f], [h], [j],

2008		[l], [m], [n], [q]
Q2 2008	40.8%	[e], [f], [h], [j], [l], [m], [n], [r]
Q3 2008	50.6%	[e], [f], [h], [j], [l], [m], [n], [s]
Q4 2008	48.9%	[e], [f], [h], [j], [l], [m], [n], [t]
Q1 2009	38.8%	[e], [f], [h], [j], [l], [m], [n], [u]
Q2 2009	30.3%	[e], [f], [h], [j], [l], [m], [n], [v]
Q3 2009	42.9%	[e], [f], [h], [j], [l], [m], [n], [w], [x]
Q4 2009	47.3%	[e], [f], [h], [j], [l], [m], [n], [y], [z]

Table 1 Sources

[a] AMD Q3 2004 Earnings Conference Call, CallStreet Transcript, October 7, 2004, pp. 2-3, 12.

[b] AMD Press Release, “AMD Reports First Quarter Results,” April 14, 2004, p. 1, available at <http://www.amd.com/us-en/Corporate/InvestorRelations/0,,51_306_643_10913,00.html>.

[c] AMD Press Release, “AMD Reports Second Quarter Results,” July 14, 2004, p. 1, available at <http://www.amd.com/us-en/Corporate/VirtualPressRoom/0,,51_104_543~87558,00.html>.

[d] AMD Q4 2004 Earnings Conference Call, CallStreet Transcript, January 18, 2005, p. 11.

[e] AMD Press Release, “AMD Reports First Quarter Results,” April 12, 2006, p. 1, available at <http://www.amd.com/us-en/Corporate/VirtualPressRoom/0,,51_104_543_13744~106886,00.html>.

[f] AMD Press Release, “AMD Reports Second Quarter Results,” July 20, 2006, p. 1, available at <http://www.amd.com/us-en/Corporate/VirtualPressRoom/0,,51_104_543_13744~110537,00.html>.

[g] AMD Press Release, “AMD Reports Third Quarter Results,” October 18, 2006, p. 1, available at <http://www.amd.com/us-en/Corporate/VirtualPressRoom/0,,51_104_543_13744~113657,00.html>.

[h] AMD Press Release, “AMD Reports Fourth Quarter and Annual Results,” January 23, 2007, pp. 1-2, <http://www.amd.com/us-en/Corporate/VirtualPressRoom/0,,51_104_543_15008~115444,00.html>.

[i] Advanced Micro Devices, Inc. 10-Q for the Quarterly Period Ended July 2, 2006, p. 29.

[j] AMD Press Release, “AMD Reports First Quarter Results,” April 19, 2007, p. 1, available at <http://www.amd.com/us-en/Corporate/VirtualPressRoom/0,,51_104_543_15008~116842,00.html>.

[k] AMD Press Release, “AMD Reports Second Quarter Results,” July 19, 2007, pp. 1-2, available at <http://www.amd.com/us-en/Corporate/VirtualPressRoom/0,,51_104_543_15008~118383,00.html>.

[l] ATI Press Release, "ATI Reports Results for First Quarter of Fiscal 2006," December 21, 2005, p. 4, <http://media.corporate-ir.net/media_files/IROL/10/105421/reports/ATI_Q106.pdf>.

[m] ATI Press Release, "ATI Reports Results for Second Quarter of Fiscal 2006," March 30, 2006, p. 5, <http://media.corporate-ir.net/media_files/IROL/10/105421/reports/ATI_Q206.pdf>.

[n] ATI Press Release, "ATI Reports Results for Third Quarter of Fiscal 2006," June 29, 2006, p. 4, available at <http://media.corporate-ir.net/media_files/IROL/10/105421/reports/ATI_Q306.pdf>.

[o] AMD Q3 2007 Earnings Conference Call, *Thomson StreetEvents* Transcript, October 18, 2007, p. 3.

[p] AMD Q4 2007 Earnings Conference Call, *Thomson StreetEvents* Transcript, January 17, 2008, pp. 2-3.

[q] AMD Q1 2008 Earnings Conference Call, *Thomson StreetEvents* Transcript, April 17, 2008, p. 3.

[r] AMD Q2 2008 Earnings Conference Call, *Thomson StreetEvents* Transcript, July 17, 2008, p. 3.

[s] AMD Q3 2008 Earnings Conference Call, *Thomson StreetEvents* Transcript, October 16, 2008, pp. 2-3.

[t] AMD Q4 2008 Earnings Conference Call, *Thomson StreetEvents* Transcript, January 22, 2009, p 3.

[u] AMD Q1 2009 Earnings Conference Call, *Thomson StreetEvents* Transcript, April 21, 2009, p. 4.

[v] AMD Q2 2009 Earnings Conference Call, *Thomson StreetEvents* Transcript, July 21, 2009, pp. 3-4.

[w] AMD Q3 2009 Earnings Conference Call, *Thomson StreetEvents* Transcript, October 15, 2009, p. 4.

[x] AMD Press Release, "AMD Reports Third Quarter Results," October 15, 2009, p. 1, available at <http://www.amd.com/us/press-releases/Pages/q3-earnings-2009oct15.aspx>.

[y] AMD Q4 2009 Earnings Conference Call, *Thomson StreetEvents* Transcript, January 21, 2010, pp. 3-4.

[z] AMD Press Release, "AMD Reports Fourth Quarter and Annual Results," January 21, 2010, p. 1, <http://ir.amd.com/phoenix.zhtml?c=74093&p=irol-newsArticle&ID=1377777&highlight=>