The Product Market Effects of Hedge Fund Activism

Hadiye Aslan
Robinson College of Business
Georgia State University
Atlanta, GA 30303

Praveen Kumar
C.T. Bauer College of Business
University of Houston
Houston, TX 77204

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Abstract

Employing a unique database on hedge fund activism (during 1996-2008) that identifies the major horizontal and vertical product market relationships of target firms, and addressing the endogeneity problem from latent industry-wide structural changes, we find that activist funds have significant real and stockholder wealth effects on product markets. Following activist investor intervention, target firms on average increase their market shares by 3.7% and improve price-cost markups by 6.2%. By contrast, industry rival firms experience significant and continued reduction in profitability, cash flows, sales growth, R&D investment, and productivity relative to the target firms. Consistent with this, the abnormal returns of rivals' stocks around the announcement of activism are significantly negative, especially when the rivals are financially constrained, or suffer from managerial slack due to location in noncompetitive industries. Results from a quasi-natural experiment indicate that input from activist funds is especially effective when the product market environment becomes more competitive. Moreover, activist fund intervention facilitates greater surplus extraction from upstream and downstream firms that are more economically dependent on the target firms. Our analysis is consistent with the hypothesis that activist hedge funds improve significantly the strategic and financial management practices of target firms, but inconsistent with the hypothesis that they facilitate monopolistic collusion or financially weaken target firms.

Keywords : Shareholder activism; Hedge funds; Product markets; Industry concentration; Supply-chain dependency

JEL classification codes: G34, L13

1 Introduction

In the seminal *Modern Corporation and Private Property*, Berle and Means (1932) highlighted the agency conflicts from the separation of ownership and control in large publicly traded companies. From the viewpoint of individual investors, they painted a rather dismal picture where the corporate entity, personified by professional management, was in complete control of the enormous capital under its disposal, and where 'disenfranchised' shareholders could have no realistic expectation of influencing in company decisions. In particular, Berle and Means were pessimistic regarding the effectiveness of shareholder activism through the proxy proposal process.[1] Instead, the focus in the succeeding decades turned to finding alternative mechanisms to protect shareholder interests and constrain unfettered managerial power, for example through the market for corporate control (Manne, 1965). Meanwhile, with their growing dominance of public equity ownership institutional investors, such as mutual and pension funds, became increasingly active in corporate governance (especially since the 1980s) through shareholder proposals, direct negotiations with management and use of media. However, this type of activism appears to have had little effect on investor wealth or firm performance (Black, 1998; Gillan and Starks, 2000; Karpoff, 2001).

Since the late 1990s, however, activist hedge funds have become the dominant face of shareholder activism, essentially taking over an arena that was once dominated by pension funds and mutual funds. Hedge fund activism (HFA) has attracted substantial public attention because of their large financial resources — 'huge war chests' (De La Merced and Creswell, 2013) — and ambitious agendas for *long-term* corporate change through shifts in strategy, capital structure changes, sales of non-performing assets, and restructuring of boards and corporate governance mechanisms.

Indeed, in contrast to the results of the earlier institutional investor activism, HFA appears to have effected significant financial and real effects on target firms, such as higher stock returns, higher payouts and leverage to reduce agency costs, and improvements in profitability and productivity (Brav et al., 2008, 2013); moreover, these positive effects appear to persist over longer-term horizons (Bebchuk et al., 2013). The significant positive effects on target firm economic performance suggest that HFA is not just a 'stock market sideshow' (Morck et al., 1990), but appears to induce real effects through some combination of improvements in productive efficiency, lower

[1] While financial institutions, such as insurance companies and banks, were often influential in corporate governance in the early part of the twentieth century, laws passed subsequently to constrain financial intermediaries also drastically reduced their role in governance. See Gillan and Starks (2007) for an excellent review of the history shareholder activism in the U.S.

agency costs, and improved business strategy. But these changes should also have *product market spillover* effects. Theoretically, exogenous productive efficiency improvements, lower agency costs and changes in business strategy can impact industry equilibrium through a variety of channels and, similarly, influence vertical relationships with customers and suppliers because of operating and financial interdependence across the value chain (see section 3). Indeed, Servaes and Tamayo (2013) document significant spillover effects of hostile takeovers on the capital investments and structures of their industry peers.

But despite intense interest by the media and policy makers, and recent scrutiny by academic economists, the product market spillover effects of HFA are poorly understood. Do firms targeted by HFA increase their profits by gaining market share at the expense of competitors or through monopolistic collusion? What are the relative effects of *different* types of HFA — targeting firm governance, presenting strategic alternatives, and demanding financial payout and leverage changes — on product markets? Do the higher payouts and leverage increases that often accompany HFA significantly weaken the competitive position of targets? Do suppliers and customers of target firms benefit or suffer from HFA? These issues are fundamentally important in understanding the main *channels* for the effects of HFA in particular, and shareholder activism in general. Yet, we currently have no clear answers to these questions.[2] In this paper, we address these issues using a hand-collected dataset that (to our knowledge) is not only the most extensive HFA sample to date — with 1,332 (1,610) unique target firms (activism events) covering 1996-2008 — but also uniquely identifies the major horizontal and vertical product market relationships of target firms from the Compustat Business Segment Files (see section 4).

However, estimating the product market spillover effects of HFA poses a challenging identification problem because the selection of targets by activist investors is not generally random and, in particular, is likely to be in response to underlying industry-wide structural changes. That is, some of the observed changes in the performance of competitive rivals and the vertical supply chain of target firms may have occurred irrespective of HFA. We control for this endogeneity issue by employing industry fixed effects and clustered standard errors as recommended by Gormley and Matsa (2013). We also utilize exogenous variation in industry-level import tariffs as a quasi-natural experiment. Since the softening of trade barriers substantially increases the competitive

[2] Using census data on manufacturing establishments, Brav et al. (2013) examine the effects of HFA on production and allocation efficiency of target firms at the plant level; however, they do not examine the effects of HFA on the product market competitors, customers and suppliers of target firms.

pressure from foreign rivals, tariff reductions represent real-side shocks that exogenously shift the competitive landscape of industries (Tybout, 2003; Bernard et al., 2006). Finally, we develop an endogenous switching regression model (see Maddala, 1983) that generalizes the classical Heckman (1979) two-stage procedure to pose a "what-if" or counterfactual question: What would have been the competitive performance of the target and rival firms *if there had been no activist investor intervention*? Our empirical findings are consistent across these various test methodologies.

We find that HFA has an economically significant influence on product markets, both with respect to horizontal competition (product market rivals) and vertical relationships (customers and suppliers). By the third year after the HFA event, target firms on average grow their market shares by 3.7% and improve price-cost markups by 6.2%, and these positive effects are amplified if targets are not likely to be financially constrained — that is, do not have very high leverage and/or have high internal liquidity. By contrast, during the same time period, the operational performance of the rival firms deteriorates significantly relative to the targets; for example, while the cash flows of rivals and target firms are roughly equal on average in the HFA event year, by the third post-HFA year rivals' cash flows are on average 2% lower than target cash flows and are 2.8% lower over the longer run. Moreover, the increase in targets' market shares in the post-HFA regime is mirrored by slower sales growth of rivals relative to targets: While rival firms on average have higher sales growth relative to target firms at the onset of activism, three years after HFA targets' sales were growing 10% faster than rivals' sales were growing. Finally, the relative post-HFA deterioration in rivals' operational performance and sales growth also appears to negatively influence their R&D investment and productivity: While rival and target firms on average have similar R&D investment (scaled by assets) and productivity in the HFA event year, by the third post-event year rivals' R&D is 1.3% lower and their productivity is 3.5% lower relative to target firms.

These negative real effects of HFA on targets' industry rivals appear to be anticipated by the financial markets. In the short-run window of [-5,+5] days around the filings of SEC form 13D — that disclose hedge funds' investment in target firms and their communications with management — rival firms, on average, experience a significant negative market-adjusted abnormal return of -1.8% in value-weighted terms. However, there is considerable heterogeneity in the announcement effects for different types of proposals. While general and governance-related proposals have insignificant announcement effects on rival firms, the corresponding effects are significantly negative — abnormal returns of at least -3.6% in both equally- and value-weighted market-adjusted returns

— for proposals demanding specific changes in business strategy and capital structure of target firms. Moreover, and consistent with observed variation in the effects of target HFA on rivals in terms of firm-specific characteristics, the negative announcement effects are amplified for highly levered rivals, or those with low cash.

Prima facie, our analysis paints a conflicting picture regarding the relation of the effects of HFA to industry concentration: the negative announcement effects (of HFA) on rival firms is higher in more concentrated industries; however, ceteris paribus the benefits of HFA on target firms' output and profits appear to be greater in less concentrated (or more competitive) industries. However, these findings are not necessarily in conflict. The onset of HFA for target firms can be viewed as an exogenous intensification of competition for their rival firms, and this competitive threat is especially pernicious for inefficient peer firms. Consistent with the notion that competition tends to eliminate managerial slack (Giroud and Mueller, 2010, 2011), rivals in noncompetitive industries are, therefore, more threatened by the onset of HFA in target firms. However, the *magnitude* of improvement in target firms' outputs and profits following HFA will depend on the elasticity of demand functions at the firm level, which are likely to be greater in more competitive industries (Raith, 2003). Thus, our results with respect to the relation of industry concentration to post-HFA target improvements in outputs and profits complement Brav et al. (2013) who find similar results, but using a different data set.

Meanwhile, the literatures on transactions cost economics (Williamson, 1975) and contracting along the value-chain (Hart and Tirole, 1990; Bolton and Whinston, 1993) suggest that HFA-induced changes in target firms — in terms of productive efficiency, business strategy, and financial structure — can impact downstream and upstream firms. As in the case of the product market spillover effects for rivals, the theoretical predictions regarding the effects of HFA on the vertical value chain are ambiguous. On the one hand, customers and suppliers with weaker bargaining positions relative to the target are likely to be negatively affected by HFA because of its emphasis on profit improvement and, therefore, greater surplus extraction. On the other hand, the benefits of target efficiency gains can be transmitted across the vertical value-chain in terms of larger output or demand. Consistent with this ambiguity, we find that on average there is no significant effect of HFA initiation on the abnormal returns of suppliers and customers. However, upstream or downstream firms with lower bargaining power, because of their location in more competitive industries and/or greater economic dependence on the target, have significant negative announcement effects on their

benchmark-adjusted stock returns in response to HFA disclosures of target firms.

The negative impact on the stockholder wealth and operating performance of rivals, in juxtaposition with the significant improvements in target market shares and price markups, suggest that activism operates through improvements in production efficiency and competitive positioning of targets, and not through increased tacit collusion with competing firms. Our evidence is consistent with the view that activist investors strategically intervene in firms that are not performing to full economic potential and/or are threatened by sudden competitive threats (such as a reduction in tariff protection), and transmit improved production organization and business strategy knowledge to target firms.[3] There is also little evidence that the aggressive financial demands of activists strategically weaken target firms by increasing their financial fragility. Rather, the demands for increased payouts and greater debt appear to reduce managerial slack and free cash flow agency costs through the incentive effects of 'hard' financial constraints (Easterbrook, 1984; Hart and Moore, 1995; Servaes and Tamayo, 2013). In a similar vein, the negative investor reaction to activism for upstream and downstream firms with higher economic dependency on targets indicates that activists help their targets extract greater surplus from the supply-chain through improved contracting and more effective bargaining. Notably, the improvements in production efficiency and increased surplus extraction in vertical relationships of target firms here are consistent with the effects of horizontal mergers and acquisitions (Fee and Thomas, 2004; Shahrur, 2005).

To our knowledge, this is the first analysis of the economic spillover effects of hedge fund activism on the product market competitors, customers, and suppliers of target firms, using a comprehensive database of activist filings (for over 13 years). By documenting the significant negative effects of target HFA on the relative operating performance, R&D investment, and sales growth of industry peers, and on the stockholder wealth of product market players associated with target firms, we fill a gap in the nascent literature on the real effects of shareholder activism, which has thus far focused attention on target firms only. However, our results complement this literature by helping clarify the main channels for the real effects of HFA on target firms documented, for example, by Brav et al. (2013) and Bebchuk et al. (2013). More broadly, we complement the recent literature that examines the spillover effects of control threats and ownership changes, such as the response of industry peers to hostile takeovers (Servaes and Tamayo, 2013).

[3] The significant improvement in target firm performance from activist investor inputs regarding strategic and financial management practices is consistent with productive effects of other "knowledge-based" interventions recently reported in the literature (Bloom et al., 2013).

We organize the paper as follows. Section 2 describes the data and sample construction for hedge fund activism. Section 3 develops the hypotheses. Section 4 describes the data sources for rivals, customers, and suppliers. Section 5 discusses the effects on rival firms, Section 6 for target firms, and Section 7 for the customers and suppliers. Section 8 concludes.

2 Hedge Fund Activism

In this section, we describe that data sources for HFA and present some of its salient characteristics. These characteristics then form the basis for hypotheses development regarding the product market effects of HFA in the next section.

2.1 Sample Construction for Target Firms

The Securities and Exchange Commission (SEC) requires that any person or entity that owns 5 percent or more of a public company's stocks file a schedule 13D, within 10 days of purchasing the shares. Schedule 13D contains identifying and background information on the filer(s) and the number of shares and percentage of outstanding equity owned. It also includes the method of purchase, the exact date of the transaction, and the purpose of the transaction (Item 4), which is the most important section of the 13D.[4] Another important section is the "Materials to be Filed as Exhibits" section. This contains any letters sent to management and elaborates on the 'Purpose of Transaction' section.[5]

We hand-collect the list of activist hedge funds by first performing a search in Factiva for the text strings "activism", "hedge fund", "hedge fund and shareholder activist", "hedge fund and shareholder activism", and "hedge fund and 13D". This search gives us approximately 140 activist hedge funds. We then examine the SEC Edgar database Schedule 13D filings that were filed between January 1996 and March 2008 by these activist hedge funds. We identify around 1,610 13D filings (and 1,762 issues targeted). From these 13D filings we manually gather: (1) the date of the filing, (2) the number and the percentage of shares held, and (3) the purpose of the transaction. Importantly, while searching Factiva, we find some instances of HFA where the fund

[4] The "Purpose of Transaction" section is the most important section of the 13D since it details exactly what the hedge fund is planning to do with its investment (whether to hold the stocks for investment or to pursue in "seeking strategic alternatives").

[5] Any changes to this filing, such as alteration of ownership, letters sent to management etc., require the filing of 13-D/A, a 13-D amendment.

has not accumulated 5 percent of the shares of the target firm, such as Icahn vs. Time Warner and Pershing Squares vs. McDonald's.[6]

We include in our sample all HFA events, even if the hedge fund did not file a 13D. For cases where a schedule 13D has not been filed, we use the event date as the first date on which the instance of activism makes public headlines. Also, for the non-filers we obtain the percentage of the target firm's shares held by the fund from the public media. We further search Factiva to collect data on the activism related developments following each event and read the subsequent 13D filings and any letters sent to management demanding changes. For those HFA events that made public headlines, we additionally follow the stories and record the if the date of resolution — either by a proxy contest or by a mutual agreement between the parties. Our HFA sample has 1,332 (1,610) [1,762] target firms (events) [issues] over a 12-year period from January 1996 to March 2008.

2.2 HFA Characteristics

A single HFA event can target multiple issues. For example, an activist hedge fund might ask a firm to pay special dividends and may nominate a representative from the fund to the board of directors at the same time. Hence, we consider these to be two separate issues, but one instance of HFA, if they are addressed at the same time. There are 112 cases where one or more funds targeted the same firm, and 21 of those were targeted by more than two funds. In addition, there are 29 hedge funds taking an activist position in more than 10 firms.

HFA can be divided into two broad categories. The first category is the "general" category where the intention of the activist hedge fund, as stated in the 13D, is to keep communications with target firm management open. The following excerpt taken from section 4 of a 13D (the "Purpose of Transaction" section) is an example of such activism:

"The Reporting Persons intend to review their investment in the Issuer on a continuing basis and may engage in discussions with management, the Board of Directors, other shareholders of the Issuer and other relevant parties concerning the business, operations, board composition, management, strategy and future plans of the Issuer."[7]

The second category of HFA is the "specific" category, where the activist hedge fund files the

[6] Icahn Fund Ltd. accumulated 2.6 percent of Time Warner and Pershing Squares collected a 4.9 stake in McDonald's when they launced their activism attacks.

[7] Source: Schedule 13D filed by Pirate Capital LLC with the SEC on September 27, 2006, indicating a 5.7 percent stake in Glatfelter PH Co.

13D and sends a letter to management asking for specific changes which can be further classified in well-defined categories: (1) governance-oriented issues including medium-term activities such as replacing board members and top management, demanding seats on the target's board of directors, trimming executive compensation etc., (2) capital structure-related changes involving activities such as share buy-back programs, changes in dividend payouts, equity issuance etc., and (3) strategic alternatives including shorter-term plans such as the quick sale of the company, liquidation of assets, proposals to spin off underperforming divisions, pushing for mergers or acquisitions, etc. An example of aggressive activism would be Schedule 13D filed by Third Point on July 17, 2006. They sent a letter to the Board of Directors of Sunterra Corporation stating:

"We demand that you devote your full resources and attention to selling Sunterra – either in whole or in its two component pieces – as expeditiously as possible."[8]

Moreover, specific-purpose HFA can be a lengthy process, and there can be several communications and confrontations between the activist hedge fund and the management of the firm, sometimes leading to lawsuits. For instance, consider the HFA episode initiated by Nelson Peltz's Trian Fund on Heinz H.J. Company in February 2006. Here, Nelson Peltz started seeking co-investors to purchase sizeable stakes in the firm. In March 2006, the fund asked for five seats on the board of Heinz, which was initially rejected by the board and led the hedge fund to start a proxy contest. Finally, in September 2006, the results of the annual meeting were announced, and the hedge-fund had won two out of the five requested seats. The details and a timeline of this HFA episode is presented in Figure 1.

We note that hedge fund targets have not always been small firms. Activists have attacked large firms such as Time Warner Inc., Blockbuster Inc., Heinz H.J. Co., Motorola Inc., Kraft Foods Inc., among others, to change business strategies. In addition, they have run proxy contests to gain seats on the boards of directors. For example, Trian Fund, LLP, recently called on Kraft Foods to focus on its grocery and frozen-foods brands, which include cheese and pizza, to sell its Post cereals and Maxwell House coffee businesses, and to use the proceeds from those sales to buy back shares. Such proposals or requests from hedge funds are not uncommon. In addition, hedge funds have confronted managers demanding changes in management and business strategies.

[8] Source: Schedule 13D filed by Third Point on July 17, 2006, indicating a 9.8 percent stake in Sunterra Corporation.

3 Hypotheses Development

In this section, we develop empirical hypotheses regarding the product market effects of HFA. We first reinterpret the different types of HFA, described in the previous section, to facilitate the analysis of product market effects. We then build on various literatures — such as the literatures on industrial organization, transactions costs, and contracting — to analyze the product market implications of HFA along both the *horizontal* dimension, i.e., for the target firm's rivals, and the *vertical* dimension, i.e., for the target firms' customers and suppliers.

3.1 Hedge Fund Intervention

Governance-oriented HFA focuses on improved managerial monitoring through demands for better governance, introduction of more effective management practices, and the design of more incentive-efficient executive compensation contracts. This type of intervention can improve the target firm's productive efficiency at a general level by reducing managerial slack and by improving allocative efficiency — especially improved capital allocation decisions — through closer board supervision (Roe, 2004). Similarly, HFA that focuses on specific strategic actions, such as changes in business focus through the elimination of unproductive assets and more efficient use of assets improves productive and allocative efficiency. Indeed, recent studies document that target firms experience positive and large increases in operating performance relative to their industry peers in the post-event (HFA) period (Brav et al., 2008; Clifford, 2008; Brav et al., 2013).[9]

Although not emphasized in the nascent literature on HFA, demands for changes in business strategy can also have positive effects on economic performance independent of efficiency gains through improved *competitive strategy* that enhances the target firms' ability to earn inframarginal profits.[10] To illustrate, consider demands that ask targets to reorient their business towards markets with lower intensity of price competition — for example, due to higher product differentiation or entry barriers (Schmalensee, 1978; Dixit, 1980) — or exercise price restraint to effect greater tacit collusion (Green and Porter, 1984). These changes can allow the targets to increase price-cost markups and even market shares — for example, with more effective product differentiation. More generally, hedge fund activists often demand that targets withdraw from business lines where they

[9] For example, Clifford (2008) finds that find that firms targeted by activists experience a large and positive (1.22%) increase in operating efficiency (ROA) in the year following the acquisition by the hedge fund.

[10] These issue have been examined, however, in the context of the product market effects of horizontal mergers and acquisitions (Fee and Thomas, 2004; Shahrur, 2005).

have a low competitive advantage and, instead, to grow business — often through strategic mergers and acquisitions — in areas where there is greater potential for rents (e.g., Pancholi, 2012). The benefits of a more effective competitive strategy may be especially significant for target firms that are economically distressed and facing predatory moves from deep-pocketed rival firms to induce exit (Benoit, 1984; Bolton and Scharfstein, 1990); conversely, activist investors can guide management to target nearby (in product space) business segments where incumbent firms are financially distressed. These positive strategic effects of HFA can also extend along the target firm's vertical value-chain, where HFA can increase surplus extraction from upstream or downstream firms through more effective strategic bargaining and contracting (Hart and Tirole, 1990; Bolton and Whinston, 1993).

Meanwhile, hedge fund activists often force firm management to increase leverage and payouts to shareholders through higher dividends share repurchases (Brav et. al., 2008; Klein and Zur, 2009). Increasing payouts and leverage can reduce free cash flow agency costs (Jensen, 1986, 1993; Servaes and Tamayo, 2013) and improve targets' investment efficiency (Bebchuk et al., 2013). However, demands for excessively high payouts and leverage increases can put targets in a *financially fragile* position and increase their default risk (Myers, 1977); consistent with this view, recent studies find that credit risk rises following HFA (Klein and Zur, 2011).[11]

To summarize, we identify *four* major channels for HFA to influence the target firm's product market environment, namely (1) improved productive efficiency, (2) more effective competitive strategy, (3) improved investment efficiency, but also possibly higher financial fragility, from capital structure changes, and (4) more effective contracting and strategic bargaining with upstream and downstream firms. We now relate these channels to the target firm's rivals and its suppliers and customers. The hypotheses generated by an analysis of these effects are summarized in Table 1.

3.2 Effects on Rivals

The effects of HFA on the product market competitors (or 'rivals') of target firms can be viewed as comparative statics on industry or oligopoly equilibrium. Take, for example, the improvements in productive and allocative efficiency induced by HFA. These are effectively exogenous cost reductions and there is a large literature that examines theoretically comparative statics on Cournot equilibrium (see, e.g., Dixit, 1986; Daughety, 2008). It is well known that the comparative statics of asymmetric marginal cost reductions in a Cournot equilibrium, where competitors' production

[11] Klein and Zur (2011) report greater incidence of ratings downgrades of target firms than upgrades within one year of the initial 13D.

decisions are strategic substitutes (Bulow et al., 1985), are generally ambiguous (Hoernig, 2003; Daughety, 2008). However, when the oligopoly game is of strategic substitutes, Dixit (1986) and Vives (2005) show that, under a certain assumptions, an exogenous cost efficiency improvement in the HFA targeted firm will raise its output and profits, while negatively affecting these variables for rival firms. On the other hand, HFA that raises target efficiency can also have positive industry-wide productivity effects by identifying effective methods for improving efficiency (Brav et al., 2013). Moreover, rivals can benefit if the activism implies undervaluation in the targeted industry and increases the likelihood that they will also be targeted by hedge fund activists (Eckbo, 1983; Song and Walkling, 2000), similar to the positive spillover effects for peer firms of hostile takeover targets (Servaes and Tamayo, 2013).

Meanwhile, a refocused competitive strategy of the target firm can have theoretically ambiguous effects on the rivals. If the new strategy allows the target firm to refocus its asset deployment to build its competitive advantage, then this may result in lower market shares, other things held fixed, for the rivals. However, rival firms may benefit from target's new business strategy if it withdraws from the market segment, or restrains price competition through tacit collusion.[12]

Finally, changes in capital structure of target firms demanded by HFA can have ambiguous effects on rivals. Such changes can improve target's investment efficiency by reducing agency costs. However, improvements in targets' investment efficiency can also have positive spillover effects on rival firms, inducing them to make similar capital structure alterations, as in the case of hostile takeovers (Servaes and Tamayo, 2013). Moreover, rivals can benefit if the capital structure changes impose financial fragility on the target. In the extreme, 'deep pocket' rivals may even attempt to force the target firm to exit through predatory pricing (Benoit, 1984; Bolton and Scharfstein, 1990).The *net* change in targets' competitive position from this channel (i.e., capital structure changes) is, therefore, theoretically ambiguous.

3.3 Effects on Vertical Relationships

While suppliers may not be directly affected under the productive efficiency hypothesis, they could indirectly benefit from improved downstream efficiency if it leads to higher output (or market share) of the target, subject to two caveats. First, the more efficient use of factors of production do not lower the target firm's input demand (even with higher output). Second, the suppliers do not lose

[12] For example, target firms may have sub-par economic performance prior to the HFA event because of excessively aggressive pricing behavior, leading to retaliation and low profit episodes (Green and Porter, 1984).

an equal or greater amount of revenue as a result of reduced purchases from the rivals of the target. On the downstream side, customers would either benefit from productive efficiency if the target firm transmits some of its cost savings to their customers, or be unaffected.

Meanwhile, the changes accompanying HFA with respect to strategic focus and governance of the target firm may prompt managers to take full advantage of the improved bargaining power conferred on their firms by hedge fund involvement. This creates an opportunity for a target to extract concessions from its suppliers. Anecdotal evidence suggests that firms improve performance is by cutting costs along the supply chain and "squeezing" suppliers for cost reductions. For instance, shortly after his appointment, Heinz CEO William R. Johnson initiated a direct strategy to cut supplier costs by at least $355 million in cost reduction ($265 million in cost of goods sold and $90 million in SG&A), and $145 million in reduced trade spend to improve margins over the next two years. Heinz also integrated its $6 billion global supply chain by better leveraging direct and indirect procurement and increased its investment in R&D and marketing.[13]

Moreover, if efficiency-driven effects accrue to target firms in the form of increased market share and market power, then the *buying power hypothesis* (Shahrur, 2005) suggests that targets exert buyer power in upstream market to extract price concessions from suppliers. Under this hypothesis, we would expect rivals to benefit and suppliers to suffer because the primary implication of countervailing power is enhanced coordination among industry competitors to obtain lower input prices (Galbraith, 1952; Snyder, 1996). If the buying power hypothesis holds, then customers would likely either benefit, if some of the cost-saving input prices are passed along in lower output prices, or suffer if increased buyer power induces suppliers to underinvest (Dobson et al., 1998). On the other hand, customers will be negatively affected by changes in the target firm's competitive strategy that enhance its ability to charge supra-competitive prices and/or by the assumption of greater strategic bargaining power by the target.

Finally, HFA that increases the target's financial fragility can hurt both customers and suppliers because of the likelihood of supply and demand disruptions due the target's financial difficulties. Even if customers bear no direct costs from the target's financial difficulties, they are likely to experience significant indirect costs because a highly leveraged supplier has weaker incentives to maintain a strong reputation for product quality, prompt and reliable delivery, and fulfilling implicit contracts with its customers (Titman, 1984; Maksimovic and Titman, 1991). In addition,

[13] http://www.businesswire.com/news/heinz/20060601005422/en/Heinz-Details-Superior-Growth-Plan-Fiscal-Years

market share gains to rivals from the target's financial fragility will have negative consequences for customers because of lower competition for the rivals.

The effects of HFA on rivals will presumably depend on the competitive environment facing the target and the nature of its economic relationship with suppliers and customers. We now discuss the role of industry concentration and supply-chain dependency.

3.4 Industry Concentration and Supply-Chain Dependence

The view that competition counteracts managerial slack implies that improvements from HFA would have greater effects on rivals in concentrated industries (Giroud and Mueller, 2010, 2011). Clearly, if intense product market competition eliminates operational inefficiencies (from the surviving companies), then there is little scope for meaningful wealth improvements from outside intervention. Indeed, Giroud and Mueller (2010) argue that "...policy efforts to improve corporate governance could benefit from focusing primarily on non-competitive industries." And since rational activist investors would choose to intervene in situations where such intervention has high expected returns, it follows that the positive effects of HFA on target performance would ceteris paribus be positively related to industry concentration. By contrast, in a model with long run free entry and exit and where firms optimally adapt managerial incentives to changing competitive positions, Raith (2003) shows that the advantages of cost improvements are higher in competitive industries where the firm level demand function is relatively elastic, so that even marginal improvements in efficiency lead to large improvements in profits and output (the "business stealing effect"); hence, under certain conditions, the positive effects of HFA on targets' market share will be negatively related to industry concentration. Indeed, using plant level data, Brav et al. (2013) find that productive efficiency improvements from HFA largely reside in low concentration industries.

Turning to the targets' customers and suppliers, the effects of improved strategic bargaining and contracting will be less pronounced if the upstream or downstream firms are concentrated because of countervailing power (e.g., Fee and Thomas, 2004). Meanwhile, the transactions costs literature (Williamson, 1975) suggests that the economic *dependency* of suppliers or customers on the target firm will influence the effects of HFA. Other things held fixed, changes in the target firm's production efficiency or strategic posture will have a greater impact (on the vertical value-chain) if the transactions costs of disrupting the long-term demand and supply relationships with the target are higher (e.g., De Jong and Noteboom, 2000).

Overall, the theoretical industrial organization and financial contracting literatures present largely ambiguous predictions regarding the effects of HFA on target firm product market competitors, customers, and suppliers (see Table 1). Similarly, there are conflicting predictions regarding the influence of industry concentration, in part because different models make varied assumptions on admissible strategies and the number of firms in the industry. We, therefore, now turn to empirical tests of the hypothesized product market effects of HFA.

4 Data and Empirical Measures

We have already described the data and sample construction of target firms in Section 2. Here, we first describe the sources for the data and sample construction for the product market players related to the target firms, and then specify our empirical measures for industry concentration and supply-chain dependency.

4.1 Sample Construction of Rivals, Customers, and Suppliers

We obtain financial data on the target firms from Compustat, and the stock returns are obtained from the Center for Research in Security Prices (CRSP). Accounting and financial data are winsorized at the one percent and 99 percent levels to address the problem of extreme outliers. In addition, segment-level financial reporting data is drawn from the Compustat Segment Customer database and supplemented by SEC filings (predominantly 10-Ks, along with 10-Qs and offer prospectuses).

We follow Lang and Stulz (1992) in identifying a target firm's industry rivals based on the four-digit SIC code. We define the onset of HFA on target firms by the *event date*, namely, the filing of the 13D. To isolate the effects of HFA on the rivals of target firms, we restrict our sample to one year before and three years after the event date — that is, our empirical tests typically compare the rivals' performance in the three years after the event date to their performance in the year prior to the HFA onset. This methodology, therefore, guides our sample selection procedure. Specifically, we require that rival firms have sales data available in Compustat for one year before and three years after the HFA event. And we eliminate (from the sample) rivals that are themselves subject to HFA within three years subsequent to the event date because the performance of these firms would be affected by the intervention of their activist investors. Finally, we require that all rival firms have daily stock return data around the event date. There are total of 45,080 rival firms

in our sample. On average, we have 34 rivals per event (i.e., 13D filing), with a minimum of one rival to a maximum of 472 rivals.

We identify major supplier-customer relationships from Compustat Business Segment Files.[14] The Statement of Financial Accounting Standards No. 14 (SFAS No.14) of the Financial Accounting Standards Board (FASB) requires firms to disclose sales to a particular customer if they exceed ten percent of total revenue or if the sales to that customer are considered important by the firm.[15] To form our sample of suppliers, we reverse the same name-matching code and match each customer name to the universe of all firms on Compustat and select those pairs that report a target firm as a major customer. We match each customer's or supplier's name as it appears in the Compustat segment file to a firm listed on Compustat and CRSP. By construction, this procedure excludes customers that are not covered by Compustat or CRSP (e.g., foreign firms, private firms, and the U.S. government). In order to ensure a reasonable sample size, following Hertzel et al. (2008), we look for a match up to five years before the filing date and if multiple matches between the same two firms occur, we choose the one closest to the filing year.[16] As in Berger and Ofek (1995) and Shin and Stulz (1998), we eliminate firms where the sum of segment sales differs from total firm sales by more than 1 percent. We also drop customer/supplier relationships that did not provide information about the percentage of sales made by a supplier to its major customer; relationships where sales to the customer constituted less than 1% of the supplier's sales (designed to increase the power of our tests); and relationships where the name of the major customer was not disclosed. These filters result in the loss of about 40% of the initial sample of customer-supplier pairs.

The matching process is complicated by the fact that the names of major customers disclosed in suppliers' financial statements are not always identical to the names that appear in other Compustat

[14] An alternative approach is to manually search 10-K reports for disclosure of major customers. We use COMPUSTAT because it reduces the cost of gathering data, introduces no obvious sample selection bias, and is consistent with the approach used by others (e.g., Fee and Thomas, 2004; Hertzel et al., 2008).

[15] SFAS 131 issued in June 1997 requires firms to disclose the sales to each principal customer, but not the name of the customer. However, S.E.C. Regulation S-K supersedes this requirement for firms with publicly traded equity (Ellis et al., 2009). Under Regulation S-K (17 C.F.R. § 229.101) (Item 101), "the name of any customer and its relationship, if any, with the registrant or its subsidiaries shall be disclosed if sales to the customer by one or more segments are made in an aggregate amount equal to 10 percent or more of the registrant's consolidated revenues and the loss of such customer would have a material adverse effect on the registrant and its subsidiaries taken as a whole." However, if for some reasons, firms do not comply with Regulation S-K and do not disclose their important customers with strong economic dependency; this would bias us against finding significant results that are consistent with our predictions.

[16] We check to ensure that relationships are still maintained even if the match is made a significant time before the actual filing. We find that relationships still exist between the firm pairs though the percent of sales varies from year to year, and even if customers may drop from the segment file in a particular year if their sales account for less than 10% of the supplier's sales.

and CRSP files. To precisely identify major customers, we initially match based on the first word of the customer's name as it appears in both the Compustat industrial files and the Compustat segment file. Because there can be multiple candidates for a match, we manually examine each match and only keep customer-supplier relationships where the customer is precisely identified.[17] This procedure results in the loss of 52% of remaining customer-supplier pairs. Finally, about 10% of remaining customer-supplier relationships are eliminated because of lack of data on the CRSP Daily File. The final sample of customers and suppliers contains 518 target firms that have at least one supplier and 382 target firms that have at least one customer that meet our inclusion criteria. There are 1,587 individual supplier firms (about 3.1 suppliers per target firm) and 621 individual customer firms (about 1.2 customers per target firm). We note that the average number of suppliers and customers per target firm in our sample are commensurate with the supply chain samples utilized in the recent corporate finance literature.[18]

4.2 Industry Concentration and Supply-Chain Dependency Measures

We use the degree of industry concentration as our proxy for the intensity with which firms interact in their product market. As a measure of competition, we utilize the widely used Herfindahl-Hirschman index (HHI). The HHI is calculated as the sum of squared market shares of firms within an industry: $HHI_{it} = \sum_{n=1}^{N_i} s_{nit}^2$, where s_{nit}^2 is the market share of firm i in industry n in year t. Market shares are computed from Compustat using firms' sales. When computing the HHI, we use all available Compustat firms, and exclude firms for which sales are either missing or negative.

We develop a measure of a supplier's vertical dependency on a customer that is targeted by hedge funds (in any sample period t), SD_t, using variable CSALE — the reported sales to each customer—

[17] This manual matching process is involved and time-consuming. In the Segments customer data, customer names do not follow a clear pattern; they are often incomplete, spelled phonetically, or otherwise abbreviated. We first apply a record-linkage algorithm that forms all the possible pairs of names for each firm and ranks the pairs based on three standard measures of string similarity used in record linkage literature (Bigram, Levenshtein, and Longest Common Subsequence) and then manually match the names of the principal customers to their GVKEY in Compustat by closely following the approach in Fee et al. (2006). We discard many of the customers listed as governments or regions. For customer names that are abbreviated, visual inspection and industry affiliation are used to determine whether the customer is listed in Compustat. For the remaining unmatched customers, we search their corporate websites or the Directory of Corporate Affiliation database to determine whether the customer is a subsidiary of a listed firm and if so, assign it to its parent's GVKEY. To ensure accuracy of customer matching, any customer name that cannot be unambiguously matched to a GVKEY is classified as "unidentified" and discarded.

[18] For example, in their studies of distressed firms, Hertzel et al (2008) report 2.2 suppliers and 2 customers per firm, while Kolay et al. (2013) report an average of 2.6 suppliers and 2.1 customers per firm; Patatoukas (2012) reports that the average supplier has 1.8 major customers, while in their M&A study Chen et al. (2011) identify 1.5 customer firms and 4.1 supplier firms for each merger.

from Compustat Business Segment Files. We define SD_t as the percentage of a supplier's totals sales that are accounted for by the target firm:

$$SD_t = \frac{\text{\$ Sales of Supplier } s \text{ to (Customer) Target } c}{\text{Total \$ Sales for Supplier } s} \tag{1}$$

Similarly, we create a dependency measure for a downstream firm, i.e., a customer of the targeted firm, CD_t, which is simply the percentage of a customer's cost of goods sold that is accounted for by purchases from the target firm:

$$CD_t = \frac{\text{\$ Purchases by Customer } c \text{ from (Supplier) Target } s}{\text{Total \$ Cost of Goods Sold by Customer } c} \tag{2}$$

Here, the total cost of goods (COGS) is obtained from Compustat.

4.3 Descriptive Statistics

Panel A of Table 1 displays some salient characteristics of target and matched peers in the year before activism. When compared to their rivals, target firms are smaller (in market value of equity), more profitable (in terms of return on assets and the ratio of EBITDA to total assets), and less levered. Target firms also exhibit significantly lower average market-to-book ratios, sales growth, and payout ratios than their rivals. These summary data suggest that while targets of HFA are not inefficient compared with their rivals, they do tend to exhibit slower growth and lower payout of dividends to shareholders. We also report some salient characteristics of customers and suppliers of the target firm. On average, and compared with the suppliers, the customers are significantly larger, more stable — that is, less levered and with greater income stability — and less dependent on their trading partner(s), based on the measures SD_t and CD_t in (1)-(2). Thus, hedge fund activism (in our sample) appears to impact firms with business-to-business sales (i.e., large customers) rather than direct sales to small and dispersed customers.

The median size (based on total assets) of rival firms in our sample is between the 7^{th} and 8^{th} deciles of the size distribution of firms in the Compustat universe during our sample period, while the median asset size of suppliers is within the 6^{th} and 7^{th} deciles and that of customers lies between the 9^{th} and the 10^{th} deciles. Thus, our sample firms tend to be somewhat larger than the firms on the Compustat universe, especially for customer firms. Meanwhile, the median profitability (ROA) of rivals lies between the 5^{th} and 6^{th} deciles of the Compustat universe, and the corresponding

placement of ROA of suppliers and customers is between the 3^{rd} and 4^{th} deciles and between 7^{th} and 8^{th} deciles, respectively. The placement in terms of leverage is similar. That is, the profitability and leverage of rival and supplier firms tends to be higher than the median firm on the Compustat universe, while that of customers tends to be smaller.

Panel B of Table 1 provides the industry distribution of the sample (rivals, customers, and rivals) at the 2-digit SIC bracket. The preponderant majority of rival (and hence target) firms — about 85% — are in the manufacturing, transportation, wholesale and retail trade, and financial industries. But the representation of the other industries is at least 2%. The distribution of suppliers and customers is similarly concentrated in the four major industry groups named above, but compared with rivals, there is a greater representation of manufacturing and trade firms but significantly lower representation of financial firms.

We now turn to studying the effects of HFA on the targets' rivals, customers, and suppliers.

5 Results: Effects on Rivals

In this section, we test the effects of HFA on rival firms of targets. We use as our framework the hypotheses developed in Section 3 (and summarized in Table 1).

5.1 Announcement Effects

A direct measure of the expected *wealth* effects of HFA is stock price reaction of targets and rivals around activism announcements. Because Brav et al. (2008) document the positive announcement effects of HFA (Schedule 13D) filings, for brevity we focus on the announcement effects on rivals. We choose a short [-5,+5] announcement window — where day 0 is the initial Schedule 13D filing date by hedge fund activists — to avoid the noise in longer windows that may obfuscate reliable inference (see Servaes and Tamayo, 2013).[19] The abnormal return of each rival i for day t is computed as $AR_{it} = R_{it} - R_{mt}$, where R_{it} is the daily return of the rival i at t, while R_{mt} is the return on the CRSP equally-weighted or value-weighted market index for that day.

Panel A of Table 3 presents the market-adjusted mean excess stock cumulative abnormal returns (CARs) for the full sample (Panel A.I) and for different groups segmented by the purpose of hedge fund activity (Panel A.II). For the overall HFA sample, we find that rivals, on average, experience

[19] However, untabulated results using a [-22,+22] day window are qualitatively similar to the short event window.

a negative CARs of about 1.8% (over the announcement window) with respect to both equally- and value-weighted market benchmarks. These negative announcement effects for the rivals are significant at 5% levels and economically sizeable; they are the converse of, but relatively smaller than, the large positive announcement effects for HFA targets reported by Brav et al. (2008) for longer event windows.[20] Figure 2 portrays the daily equally-weighted abnormal returns for the event window.

Turning to the effects of different types of HFA proposals, while general proposals have insignificant announcement effects, the corresponding effects are significantly negative for two of the three major types of specific proposals. Proposals demanding changes in firm governance have insignificant announcement effects, which is consistent with the literature that finds insignificant investor reaction to shareholder proposals related to board and governance issues from the viewpoint of *target* stock returns (Gillan and Starks, 2000). In contrast, the demands for specific changes in strategy and capital structure have significantly negative and economically sizeable stock price effects on rival firms.

In particular, specific strategic alternatives lower rival firms' CARs (in the event window) by at least 3.6% in both equally- and value-weighted market-adjusted returns, and the difference between the effects of general and strategic alternatives proposals are highly significant. Thus, the analysis of the announcement effects of the initiation of HFA on rivals of target firms supports the view that HFA leads to efficiency enhancement and improved competitive positioning of target firms, but it is inconsistent with the hypotheses that HFA generates greater monopolistic collusion, which would benefit the rival firms as well. These results also complement the findings of Brav et al. (2008) who find that activism related to specific investment actions and changes in business strategy generates the largest target abnormal returns.

Moreover, proposals calling for changes in capital structure have significant negative announcement effects of over 2.1% in market-adjusted terms over the announcement window. Thus, the stock market response to demands for capital structure changes by activist investors supports the view that these changes improve investment efficiency and reduce free cash flow agency costs of targets rather than create financial fragility for them. In this sense, our results complement Servaes and Tamayo (2013) who find that by improving investment efficiency and reducing agency costs of target firms, hostile takeovers induce similar improvements in the peer firms of targets. Indeed,

[20] Brav et al. (2008) report average abnormal returns in the range of 7% to 8% during the [–20,+20] announcement window.

for a similar event window, Servaes and Tamayo (2013) find significant positive abnormal returns for the peer firms. The difference in the stock market response for peer firms could stem from two important differences between hostile takeovers and HFA. First, as we have illustrated in Section 2 above, HFA is rarely limited to a single issue. Even if the original 13D filing emphasizes capital structure changes, for example, financial markets appear to understand that activist investors will also intervene (when needed) to improve operational efficiency and strategic positioning. By contrast, targets of hostile takeovers do not necessarily have the benefit of such 'best practices' business advice. Hence, as our empirical analysis suggests, the positive efficiency spillover effects of HFA on the industry can be dominated by the improvements in the operating efficiency and competitive positioning of target firms *relative* to their rivals. Second, targets of HFA benefit from the explicit interest and potential support of 'deep pockets' activist investors, namely, hedge funds, whereas, by contrast, targets of hostile takeovers may be left in a weakened financial condition following costly anti-takeover defensive actions by incumbent management.

In terms of rivals' characteristics, we expect that improvements in targets' productive efficiency and competitive positioning will ceteris paribus have a more negative impact on more levered rivals with lower financial flexibility — for example because of transactions costs in external financing (Froot et al., 1993). In contrast, firms with significant cash holdings should be able to better withstand strategic threats from the improved productive efficiency and competitive positioning of competitors (Fresard, 2010). Panel B of Table 3 provides benchmark-adjusted mean excess stock returns by rivals' leverage (Panel B.I) and cash holdings (Panel B.II), and target's industry concentration, as measured by the HHI (Panel B.III).

Consistent with these predictions, we find that highly levered rival firms (with leverage above the sample median) have significantly greater negative announcement effects of HFA compared with low leverage rivals. Indeed, low leverage rivals do not suffer significant negative announcement effects of the initiation of HFA. Similarly, rival firms with low cash holdings (relative to assets) suffer significantly greater negative announcement effects compared with rivals with high cash holdings; in fact, the announcements effects on the rivals with high cash assets are insignificant.

We also find that the rivals of HFA target firms in highly concentrated industries, with an HHI above the median, experience significantly negative announcement effects, but the announcements effects on more competitive industries are not statistically significant. Indeed, the difference between the HFA announcement effects on rivals of targets in concentrated and competitive industries are

highly statistically significant. These results are consistent with the hypothesis that improvements in productive efficiency and business strategy of HFA targets will be more beneficial in concentrated industries because managerial slack (and operational inefficiencies) would be eliminated in intensely competitive industries (Giroud and Mueller, 2010, 2011).

5.2 Cross-Sectional Determinants of Abnormal Returns

Table 4 presents the presents the cross-sectional relation between abnormal returns of rival firms of HFA targets (in the [-5,+5] day announcement window) and a set of explanatory variables that include HFA proposal types and firm- and industry-level characteristics. In panel A of this Table, we analyze the effects of HFA on rivals based on the type of activism and rivals' characteristics, while in panel B we consider the effects of industry concentration.[21] As we noted at the outset, unobserved heterogeneity in the form of (calendar) time- and industry-specific shocks is a concern in the analysis of the effects of HFA. Following the recommendations of Gormley and Matsa (2013), we use year and industry fixed-effects to help control for this form of unobserved heterogeneity; moreover, we report robust standard errors clustered at the industry level to address the possibility of errors terms that are correlated across a given industry.[22]

The estimates of the base model 1A reinforce the conclusion from Table 3 that demands for specific strategic and financial policy changes have significantly negative announcement effects on rival firms's (abnormal) stock returns, and these effects are economically quite significant. For example, HFA focused on specific strategic actions ceteris paribus reduces the CARs of rival firms by 2.9%, on average, during the event window. Similarly, proposals that alter capital structure to make the target firm more financially viable and/or reducing managerial slack reduce the CARs of rival firms by 1.8%, on average. However, proposals demanding changes in firm governance have an

[21] In these models we do not include an intercept term because the specific proposal categories need not generally be mutually exclusive and the overlaps in the dummy identifiers can make results unreliable in the presence of an intercept term. Instead, we use a dummy identifier for the general proposal category, which allows us to interpret the estimated coefficients of the specific proposal categories in terms of their effects on rivals' CARs. For example, if a hedge fund puts forward strategic alternatives and capital structure related proposals and if their estimated coefficients from the cross-sectional regressions are a and b, respectively, then the total announcement effects of the HFA on rivals' CARs is $(a + b)$%.

[22] Gormley and Matsa (2013) show that fixed-effects (FE) estimators provide consistent estimates, which is not the case generally for estimates based on" industry adjustments" of the dependent variable (for example, by demeaning the dependent variable with respect to the industry) or by using the industry average as a control variable. However, with FE estimation there are reduced degrees of freedom that may require adjusting the standard errors. But such adjustments are not needed when one uses cluster-robust standard errors (which allow for both heteroscedasticity and within-group correlations) as long as the firm fixed effects are nested within the firm and industry clusters, as is the case here (Gormley and Matsa, 2013).

insignificant impact. These results suggest that HFA on average worsens the economic outlook for the product market rivals mostly by improving the competitive positioning and business strategy of targets, along with improving their managerial efficiency and financial viability. In particular, we do not see evidence of HFA significantly increasing financial fragility of targets, as is sometimes hypothesized (see Table 1).

Reinforcing the univariate results, we also find that the negative effects of HFA are significantly greater for more levered rivals with lower internal liquidity — that is, for rivals that are more likely to be financially constrained in responding to the improved target performance due to HFA. Consistent with this interpretation, the interaction effects in models 2A-4A indicate that, at the margin, the negative effects of specific HFA proposals (on strategic alternatives and capital structure) for the competitive rivals of target firms are significantly greater when the rivals are more levered and have lower internal liquidity. In fact, even proposals that improve governance of targets have significant negative effects on rivals with high leverage. Finally, controlling for the other factors, the target's firm size does not significantly influence the effects of HFA on their rivals.

In panel B, we examine the influence of industry concentration on the effects of HFA on rival firms, using the HHI. Consistent with the hypothesis that the effects of competitive improvements by target firms would be greater in less competitive industries (cf. Section 3.4), the negative wealth effects of HFA on rivals are significantly greater in more concentrated industries. And this effect is also economically significant. Other things held fixed, disclosure of HFA lowers the CARs of rivals (in the event window) by an additional 2.9% when targets are located in industries with above-median HHI (model 2B). Moreover, in model 3B, we find that the effects of specific HFA proposals (relating to strategic and capital structure changes) are higher, at the margin, in less competitive industries. Thus, this multivariate analysis also complements the results of Giroud and Mueller (2010, 2011). We will consider the role of industry concentration further below in Section 6.2.

5.3 Robustness Tests

As a robustness check on the announcement effects reported in Table 3, we utilized an alternative selection criteria for rival firms. In the alternative selection criteria, a rival firm matched to the target of HFA must (1) be in the same industry, i.e., share at least three-digits in the industry SIC code with the target, (2) have accounting data available in Compustat for one year before and three years after the HFA event, (3) have size (market capitalization) between 25% and 200% of

the target firm. By applying these criteria, we are able to find matching rivals for 94% of the target firms. If there are no matching rivals in the same industry that meet the size requirement, we relax the last constraint and a matching firm is then chosen without regard to size. Untabulated results indicate that the results of Table 3 are not materially affected.

Next, in Table 3, we give each rival firm observation the same weight — that is, our analysis treats the individual abnormal returns for each rival firm as a separate observation. But target firms can have very different number of rivals. Hence, as a robustness check for the analysis in Panel A of Table 3, we adopt an alternative weighting approach whereby we first average the abnormal returns for rivals for each HFA event and then take the average across these events. This procedure gives an equal weight to each HFA event regardless of the number of rivals. Effectively, in this approach we group the rivals of each target firm into an equal-weighted *portfolio* and treat the *portfolio* as a single observation. Our untabulated results are robust.

In a similar vein, our cross-sectional analysis in Table 4 puts more weight on those target firms that have more rivals. To address this issue, we repeat the analysis in Table 4 wherein we treat each HFA event as the unit of observation. We do so by estimating between-group estimators in a fixed effects framework (see Greene, 1997, p. 618). That is, we utilize a "between-effects" regression, which is a cross-sectional regression where the dependent and independent variables are the averages of the variables for each HFA event. In our case, the only variation is in the averages of rival firm characteristics across HFA events. The "between" estimator has the advantage of removing any unstructured cluster effects; it, therefore, can increase the efficiency of OLS estimation. The results (untabulated) are qualitatively the same as in Table 4.

Finally, as another robustness check, we also re-calculated abnormal returns using the market model rather than benchmarking with respect to the equally- or value-weighted CRSP market index. Specifically, we use daily returns for 240 days (covering the period $t-300$ through $t-61$) to estimate the market model parameters for each rival firm, where t represents the HFA event date for the target firm.[23] The CARs are then computed based on the difference between the observed daily return and the estimated market model returns. Again, untabulated results show that our results are robust.

Overall, the univariate and multivariate analyses of the stock market announcement effects (Tables 3 and 4) suggest that the anticipated product market effects of HFA on the competitors

[23] We require a minimum of 100 daily returns or the case is deleted.

of target firms occur when activists propose specific changes in the business strategy and financial policies of targets. Moreover, these effects are significantly negative on average, indicating that HFA improves target firms' productive efficiency and competitive positioning, but does not lead to enhanced monopolistic collusion or does not strategically weaken targets by reducing their financial flexibility. The anticipated effects of HFA are significantly greater in less competitive (i.e., more concentrated) industries and for rivals with financial constraints.

We now turn to an analysis of the real effects of target HFA on rival firms.

5.4 Dynamic Real Effects of HFA on Rivals

An important issue in estimating the effects of HFA on target firms' product market performance is to control for underlying trends in the industry. The selection of targets by activist investors is not generally random (see, e.g., Greenwood and Schor, 2009); in particular, activist investors are likely to opportunistically intervene based on industry-wide structural changes.[24] That is, at least some of the observed real effects on rivals may have occurred even without HFA on target firms. We, therefore, examine the effects of HFA on rivals' operational performance, investment, sales growth, and productivity *in excess of (or relative to) the target* for the first three years after the HFA. Using the relative performance measure helps control for the possibility that alterations in the real performance of peer firms are due to underlying industry-wide changes — presumably such changes would also affect the performance of target firms. In the next section, we will complement this analysis by examining changes in targets' competitive performance using other methods to control for the non-random choice of targets.

Specifically, let for each target firm i, y_{ijt} be the real performance measure of rival firm j in excess of the target firm's performance in year t. Then we estimate the relation:

$$y_{ijt} = \alpha + \sum_{k=0}^{3} \beta_k Activism_{t-k} + \beta_4 Activism_{t-n} + u_{ij} + d_t + \varepsilon_{it} \tag{3}$$

Here, u_{ij} and d_t represent rival-specific and calendar year fixed effects, respectively; $Activism_{t-j}$ are dummy variables that take a value of 1 if year $t-k$ was the HFA event year; $Activism_{t-n}$ is a dummy variable that takes the value of 1 if the HFA event occurred more than three years before (year t). Thus, the fixed-effects model, specified in (3), treats the rival firm itself before the

[24] We are grateful to the referee for emphasizing this point to us.

HFA event as a control for its (the rival's) post-activism behavior (see Pagano et al., 1998). The standard errors are robust to heteroskedasticity and are clustered at the industry level to account for intra-industry correlation in the error structure. We display the results of this analysis in Table 5. A positive (negative) coefficient in year t implies that the relative performance measure increases (decreases) in that year compared to its value in the pre-activism period. We include a column that represents the results (probability values) of the *F-test* for the null hypothesis that the sum of the coefficients on the post-activism dummies is zero.

The operational performance of rivals — as measured by return on equity (ROA), or EBITDA, or cash flows — deteriorates significantly relative to the targets after the initiation of HFA. Notably, the rivals' relative operational performance continues to decline in the first three post-HFA years, possibly reflecting the lag in the effects of HFA; such lags can occur, first, because of the time taken to operationalize the changes induced by HFA in the target firms and, second, because of the lags in the effects of theses changes in the product markets. The negative effects on the rivals' relative operational performance measures are both statistically and economically significant. For example, while the cash flows of rivals and target firms are roughly equal in the HFA year, by the third post-HFA year rivals' cash flows are on average 2% lower than target cash flows and 2.8% lower over the longer run, while the corresponding reduction in the rivals' EBITDA relative to targets is 2.4% and 2.7%, respectively.

We also find that the rival firms significantly reduce their R&D spending relative to the target firms by the end of the second year after the HFA event. (However, there appear no significant effects on non-R&D capital expenditures.) Concomitant with the reduction in R&D spending, there is a significant reduction in the total factor productivity (TFP) of these firms, especially after three years from the HFA event. The adverse TFP effects are economically significant, with an average reduction of 4% after the end of the third year, and are in marked contrast to the positive effects of HFA on the TFP of targets found by Brav et al. (2013). Interestingly, the reduction in R&D spending of the peer firms is similar to the reaction of peer firms of targets of hostile takeovers, documented by Servaes and Tamayo (2013). However, in the case of hostile takeovers the fall in R&D spending is part of the reduction in overall capital spending by management of peer firms to lower their agency costs and avoid a similar takeover of their own firms. In contrast, the reduction in R&D spending by rival firms (of HFA targets) appears to be forced by lower cash flows and profitability from their weakened competitive positions, possibly contributing to their

lower productive efficiency.

The reduction in R&D and the fall in TFP suggest that HFA may have long run deleterious effects on the rival firms, since R&D investment is crucial for maintaining and enhancing long run competitive advantage. Indeed, the relative sales growth performance of rivals appears to confirm this conjecture: While rival firms on average have higher sales growth relative to rivals in the HFA event year and the year after, by the end of the second post-HFA year rivals' sales are growing at a slower rate than target firms, and this difference accentuates in the succeeding years. Moreover, the deterioration of sales growth of peer firms relative to targets is economically sizeable: By the end of third post-HFA year, on average, targets' sales are growing 10% faster than rivals' sales are, and targets' positive sales growth differential over rivals is 14% in the longer run. We note that the positive relative performance of rivals' sales growth in the HFA year is consistent with the view that activist investors intervene to improve competitive under-performance of target firms.

The results in Table 5 reinforce the inference from the analysis of the announcement effects and the cross-sectional analysis in the previous section, namely, that HFA on average has significantly negative effects on the economic performance, R&D spending, productive efficiency, and sales growth of the rival firms. But if the negative effects of target HFA on rival firms reflect improved production efficiency and competitive positioning of the targets, then theory predicts that under certain conditions we should observe expanding market shares and improving price markups for targets following the HFA event (see Section 3.2). We, therefore, now examine the influence of HFA on targets' market shares and price markups over marginal costs in our sample, while controlling for the latent industry effects that we mentioned above.

6 Results: Effects on Targets' Market Shares and Price Markups

In the standard fashion, we measure market shares of the target by the ratio of its annual sales to the total sales by the target and its matched rivals. And for estimating the firm-level price-cost markups, we use an empirical model that relies on standard cost minimization conditions for variable inputs free of adjustment costs. These conditions relate the output elasticity of an input to its expenditure share in the total sales. We define the markup μ as the ratio of output price (P) to the marginal cost. To simplify the estimation, we let X be the composite input with the input price W. If the firm is a price-taker in the input market, then the marginal cost is $W\left(\frac{\partial X}{\partial Q}\right)$, where Q is the output. Hence, using the output elasticity with respect to input X, namely, $\xi^X \equiv \left(\frac{\partial X}{\partial Q}\right)^{-1}\left(\frac{X}{Q}\right)$,

we can write the price markup for firm i at t as:

$$\mu_{it} = \xi_i^X \left(\frac{W_t X_{it}}{P_{it} Q_{it}} \right)^{-1} \tag{4}$$

We obtain the output elasticity from the estimation of a production function and need only to measure the share of an input's expenditure in total sales. The details and data sources are summarized in the Appendix A.

6.1 Controlling for Latent Industry-Wide Effects

We use three methods to help control for the latent industry effects that we mentioned above.

6.1.1 Industry Fixed Effects Estimation

First, to control for unobservable industry-wide shocks we follow Gormley and Matsa (2013) and use a fixed-effects estimator. Specifically, let y_{it} denote the market share or the price-cost markup (see below) of target firm i at year t, where t is restricted to one year before and three years after the start of the HFA. Then we estimate the regression equation using OLS:

$$\begin{aligned} y_{it} \;=\; & \beta_0 + \beta_1 \; Target_{it} + \beta_2 \; PostActivism_{it} + \beta_3 \; Target_{it} {}^{*} PostActivism_{it} + \\ & \mathbf{x}_{it}' \boldsymbol{\gamma} + \mathbf{1}' \Lambda_{fe} + \varepsilon_{it} \end{aligned} \tag{5}$$

where, *Target* is a dummy variable that takes a value of 1 for firms targeted by an activist hedge fund in a given year; *PostActivism* is a dummy variable that takes a value of 1 after the HFA event; $\Lambda_{fe} = [\mu_{ind} \; \phi_{year}]$ is a vector of year and industry dummies; $\mathbf{1}$ is a vector of ones; $\mathbf{x}_{it}$ is a vector that includes other variables that influence product market performance. Specifically, these covariates include Tobin's Q, Cash, Leverage, log of Size, Credit Spread, ROA, HHI, R&D, and lagged market share and markups.[25] We also include pre-event time dummies (for up to 3 years prior to the event) to help control for the possibility that observed post-HFA changes in target market shares and markups simply reflect continuation of underlying industry-wide changes that were occurring prior to the event. Finally, to highlight the role of leverage, internal liquidity, and

[25] We note that lagged market share growth captures the influence of other firm characteristics that may have driven competitive performance in the recent past, such as a change in store location or distribution network.

industry concentration of target firms (cf. Tables 3 and 4), we use the triple interaction terms of $Target_{it}$*$PostActivism$ with leverage, cash and HHI, where we allow the HHI to be time-varying.

6.1.2 Quasi-Natural Experiment

Second, we exploit exogenous variation in industry-level import tariffs as a quasi-natural experiment. Since the softening of trade barriers increases the competitive pressure from foreign rivals, the literature views large reductions in import tariffs as significant exogenous variations in the competitive environment of firms (see Tybout, 2003). In particular, Bernard et al. (2006) argue that lowering of trade barriers triggers significant intensification of competitive pressures from foreign rivals. To measure increases in product market competition, we use industry-level import tariff data compiled by Feenstra (1996), Feenstra et al. (2002), and Schott (2010).[26] These data are available at the 4-digit SIC (Standard Industry Classification) level for the U.S. manufacturing sector (SIC 2000-3999) from 1996 to 2005.[27] For each 4-digit SIC industry and year, we compute the ad valorem tariff rate which is the ratio of duties collected by the U.S. custom to the free-on-board value of imports.

We follow the common practice in the literature and consider only "large" tariff reductions, i.e., tariff reductions that are above a certain threshold (e.g., Fresard, 2010; Lileeva and Trefler, 2010; Fresard and Valta, 2012).[28] Specifically, we qualify a tariff rate reduction in a given industry-year as large if it is 3 times larger than its median change in tariff rate in the same industry across all years. The average effective U.S. tariff rate for imported goods declined significantly in our sample period because it coincides with the adoption of the North American Free Trade Agreement (NAFTA) in 1994 that resulted in substantial cuts in tariff rates — the last being implemented in 1998. For example, the average rate declined from 3.8% in 1997 to 2.1% in 1999, which corresponds to an average decrease in tariff rates by about 43%. Studies show that such large tariff reductions lead to substantial increases in import penetration (by about 20%) (Trefler, 1993; Lee and Swagel, 1997; Bernard et al., 2006).

After identifying the industry level tariff reductions, we estimate and enhanced version of (5) where we estimate the effects of tariff cuts by adding CUT_j to the interaction terms, where CUT_j

[26] The tariff data are available on Peter Schott's Web site: http://www.som.yale.edu/faculty/pks4/sub_international.htm

[27] Products imported to the U.S. are coded based on the Harmonized System (HS) established by the World Customs Organization (WCO). Each product is assigned a ten-digit HS code. Feenstra (1996) and Schott (2010) have developed concordance tables that map each HS product code into four-digit SIC codes.

[28] This is because tariff rates fluctuate yearly and the typical change is small.

is a dummy variable that equals one if industry j has experienced a tariff cut over the last two years (t and $t-1$) of activism. Importantly, because tariff reductions occur in different industries in different periods, this test effectively takes as a control group all firms operating in industries that do not experience a reduction in tariff in year t. Consequently, the coefficients of the interaction between HFA and tariff cuts measure the difference in HFA sensitivity between firms that experience an unanticipated competitive shock and firms that do not. In contrast, if the positive association between HFA and product market performance only arises because firms can perfectly foresee the competitive outcomes related to fund intervention, then the effect of activism on competitive performance should not be altered by tariff reductions. Difference-in-difference regressions, therefore, allow us to reliably infer the impact of HFA on market shares and price markups of targets.[29]

6.1.3 Endogenous Switching Regression Estimation

Finally, we use an endogenous switching regression model (Maddala, 1983) to address the fact that the choice of target firms by activist investors is not generally random. As we now describe, this approach allows us to pose a "what-if" question: Given a firm that is the target of HFA, what would have been its market share and price-cost markup if it had *not* been targeted by activist investors? Similarly, we can ask: What would have been the average impact on the market shares and price-cost markups of the rivals if the target firm had not been subject to activist intervention? A key advantage of this framework is, thus, that we obtain more useful estimates of (unobserved) counterfactual outcomes.

Specifically, the binary decision by activist investors to target or not target a firm i at time t,namely, $Target_{it}$ is modeled as the outcome of an unobserved latent variable $Target^*_{it}$ so that:

$$Target_{it} = \begin{cases} 1, & \text{if } Target^*_{it} > 0 \\ 0, & \text{otherwise} \end{cases} \tag{6}$$

The unobserved latent variable is assumed to depend on a vector of variables z_{it} that are correlated with the propensity to target the firm — these variables include target-specific characteristics and

[29] This procedure gives us three quadruple interaction coeffcients to investigate whether the effects co-vary with industry concentration, industry adjusted leverage and cash holdings of the target. Significance tests of the coefficient of the quadruple interactions can show whether a tariff cut of a certain magnitude affects the relation between activism and market shares or markups for less levered, cash-rich targets and targets in less concentrated industries, respectively.

market conditions:

$$Target^{*}_{it} = z^{'}_{it-1}\gamma + u_{it} \tag{7}$$

Here, u_{it} is an error or residual term with mean zero conditional on the variables in z_{it-1}. Hence, the binary decision to target a firm is modeled as $\text{Target}_{it} = 1$ iff $z^{'}_{it-1}\gamma + u_{it} > 0$ and $\text{Target}_{it} = 0$ iff $z^{'}_{it-1}\gamma + u_{it} \leq 0$, where u_{it} is an error or residual term with mean zero conditional on the variables in z_{it-1}.

Next, let y_{1it} (y_{2it}) be the target's market share if there is (is not) activist intervention. (The procedure for price-cost markups is similar.) Of course, we only observe y_{1it} or y_{2it} and never both. The switching regression framework then models the market shares (or price-cost markups) with or without HFA as two separate linear equations:

$$y_{1it} = \mathbf{w}'_{1it-1}\beta_1 + \varepsilon_{1it} \tag{8}$$

$$y_{2it} = \mathbf{w}'_{2it-1}\beta_2 + \varepsilon_{2it} \tag{9}$$

where the vector w includes a constant term and other control variables that influence product market performance (cf. Equation (5)), while ε_{1it},and ε_{2it} are mean zero error terms.

We model the endogeneity between activist investors' decision to target a firm and post-event market shares (or price-cost markups) by allowing the residuals in the performance equations (8)-(9) to correlate with the residual in the selection equation (7); hence, the unobserved or missing variables — for example, the industry-wide structural changes — in the selection equation also affect the market shares and markups. Specifically, the error terms $(\varepsilon_{1i}, \varepsilon_{2i}, u_i)$ are assumed to be trivariate normal with means $(0, 0, 0)$ and the non-diagonal covariance matrix:

$$\Sigma \equiv cov(\varepsilon_{1i}, \varepsilon_{2i}, u_i) = \begin{pmatrix} \sigma_{11} & \sigma_{12} & \sigma_{1u} \\ \sigma_{12} & \sigma_{22} & \sigma_{2u} \\ \sigma_{1u} & \sigma_{2u} & 1 \end{pmatrix} \tag{10}$$

(We note that $Var(u)$ is normalized to 1.). The error structure in (10) permits a nonzero correlation between the shocks to product market outcomes and the shocks to firms' characteristics and endogenous switching between the product market behaviors. This model is a generalization of the classical Heckman (1979) two-stage procedure in the following sense: Instead of the two competitive

performance equations for the targeted and non-targeted firms (cf. (8)-(9)), under the Heckman (1979) model there would be only one second-stage equation, which in effect restricts the beta coefficients in equations (8)-(9) to be the same across firm-types (targeted versus non-targeted).[30] But a model with one performance equation would appear to be more suitable for truncated data where the alternative is not observed — such as the effect of labor participation on wage rates, where wages are unobservable for people not in the labor force. However, because observations on market shares or markups are not truncated but, rather, relate to different firm-types (in terms of being targeted by HFA), the two-equation model is more appropriate for our setting.

We note that in order to fully identify the switching regression model we need to determine which firms have been subject to HFA and which have not. The algorithm specified in Equations (6)-(9) creates two groups of firms that differ according to their product market behavior, but it does not automatically tell the econometrician which firms are the target firms. However, an advantage of this approach is that it allows us to utilize multiple variables to predict whether firms are likely to be targeted by hedge funds in the selection equation (Equation (7)). In contrast, the traditional method of splitting the sample according to a priori characteristics is typically implemented using one characteristic at a time. We will exploit this to build on the literature and determine the firm-specific characteristics to include in the selection vector z in Equation (7). As we will see below, this assignment (into HFA and non-HFA regimes) turns out to be unambiguous in our data, allowing us to achieve identification.

We estimate the model using maximum likelihood (see Appendix B). To infer the competitive performance impact of HFA, we compute the difference between the actual performance of a targeted firm i (i.e., y_{1it}) and the estimated performance *this target* would have obtained if it had not been targeted (i.e., y_{2it}) — the "counterfactual" performance.[31] The resultant quantity is what we will call the "HFA competitive performance improvement" for the target firm i, and is given by:

$$\delta_{it} = \underbrace{y_{1it}}_{\text{actual}} - \underbrace{E\left[y_{2it} \middle| Target^*_{it} > 0\right]}_{\text{hypothetical}} \tag{11}$$

Further details on the estimation and inference of the model are given in Appendix B.

[30] This model was first proposed by Roy (1951) to study occupational choices. Lee (1978) applies this model in a study of unionism and wages, while Dunbar (1995) does so in a study on the use of warrants for underwriter compensation.

[31] This counterfactual performance is easily computed by using $y_{2it} = \mathbf{w}'_{2it-1}\beta_2 + \varepsilon_{2it}$ from (8). Note that in Equation (11) below, the conditioning is on $Target^*_{it} > 0$ to reflect the fact that we are dealing with a targeted firm.

6.2 Results

Table 6 reports the main estimation results for several different specifications of (5) in panel A, while panel B reports the results of the quasi-natural experiment using exogenous industry-level tariff cuts. To facilitate the comparison of the estimates, we present estimated coefficients scaled by the corresponding variables' standard deviation. The first column of panel A gives a baseline estimation where we suppress the role of target leverage and cash, and the industry concentration — that is, we force the coefficients of the triple interaction terms to be zero in Equation (5). We find that HFA has a significant positive effect on target market shares; the effects are not highly significant statistically but are also economically sizeable: Ceteris paribus, target firms have 3.7% improvement in market share in the 3 years after the initiation of HFA compared with the year before. These results are consistent with the deterioration in the sales growth of rival firms relative to the target firm following HFA that is observed in Table 5. In column 2 of panel A, we examine only the effects of target leverage, and find that controlling for the industry fixed effects, targets' leverage does not significantly influence the market share improvements from HFA. However, column 3 shows that more liquid firms have greater improvements in market shares from HFA, other things held fixed: Increasing the cash-to-assets ratio by 1 standard deviation increases the 3 year post-HFA improvement by 6.4%. Furthermore, ceteris paribus the market share improvement is negatively related to industry concentration, or is positively related to the competition intensity of the industry. We note that while the role of target leverage and internal liquidity is consistent with the analysis of announcement effects of HFA on rivals of target firms (cf. Section 5.1), the influence of industry concentration here appears to be at odds with that analysis. We will return to this issue at the end of this section.

In panel B, the baseline model (column 1) shows that HFA is especially effective in improving target market shares in industries that experienced a tariff cut immediately preceding the initiation of activist investor intervention; and this effect is highly statistically significant and economically non-trivial: Target firms in industries exposed to tariff cuts on average improve market shares by 4.8% more than targets in non-exposed industries. Thus, HFA appears to be especially beneficial when targets are in industries that face competitive *shocks,* namely, unanticipated changes in competition intensity due to regulatory changes. Here we emphasize the distinction between competitive shocks, which may be transient, and medium to long run industry competitiveness that is reflected in its concentration, as measured by the HHI. Indeed, the incidence of tariff cuts and

industry concentration appear independent in our sample, which is intuitively plausible: the mean HHI of industries exposed to tariff cuts is 0.186, while the mean HHI for the non exposed industries is 0.177, and the difference is not significant. In sum, as we mentioned above, activist investors may be motivated to intervene based on longer run structural changes in the industry. But it is also intuitively plausible, and confirmed by the results here, that these investors may also intervene when firms (in which they have non-trivial stock holdings) face sudden competitive threats.

We do not find leverage to play a significant role on the effects of HFA on market shares of targets between exposed and non-exposed industries. But, similar to panel A, targets with higher cash holdings are able to improve market shares after HFA in exposed industries compared with non-exposed industries. Specifically, a one standard deviation increase in the cash-to-assets ratio of target firms in exposed industries raises post-HFA market shares by 8% (or 2.4% higher than the improvements in targets in non-exposed industries). Finally, we find — similar to panel A — that the improvement in targets' market shares post-HFA is negatively related to the industry concentration. That is, activist investor intervention following shocks that increase competition intensity in the industry are more effective in raising markets shares in industries that are more competitive (in terms of low concentration). In sum, the results from the quasi-natural experiment complement the results from the industry fixed-effects analysis.

Next, in Table 7 we report the results analogous to Table 6, but for targets' price-cost markups. We estimate markups for each target and their rival firms up to three years after and one year before the hedge fund intervention using 5 different models that are summarized in Table A.1 in the Appendix. The analysis in Table 7 are based on Model 4 in Table A.1, but the results using other models are similar. In panel A of Table 7, the baseline model estimation shows that ceteris paribus target firms have 6.2% improvement in markups in the 3 years after the initiation of HFA compared with the year before. Column 2 of panel A shows that more levered targets have lower improvements in markups from HFA, other things held fixed: Increasing the debt-to-assets ratio by one standard deviation implies that the 3 year post-HFA improvement in markups is only 4.3% (rather than 6% for the average firm). Meanwhile, column 3 (of panel A) shows that controlling for the industry fixed effects, targets' cash holdings do not significantly influence the market share improvements from HFA. However, we find that ceteris paribus the markup improvement is negatively related to industry concentration, as is the case with market shares in Table 6.

The analysis in panel B of Table 7 is qualitatively similar to that given in panel B of Table

6. Specifically, HFA has a significant positive effects on markups of targets in industries exposed to tariff cuts. Moreover, like panel A we find that more levered targets have lower markup improvements, but unlike the fixed effects estimation, the results in panel B indicate that firms with higher internal liquidity significantly are able to amplify the positive effects of HFA on markups: A one standard deviation increase in increases in the cash-to-assets ratio of target firms in exposed industries raises post-HFA market shares by 7.6% (or 1.8% more than similar firms in non-exposed industries). Finally, column 4 of panel B shows that ceteris paribus the market share improvement is negatively related to industry concentration, which is similar to the relation seen in Table 6 for market shares.

We now turn to estimation of the endogenous switching model (cf. Section 6.1.3). We include in our selection vector z firm-specific attributes that are shown in the literature to be significantly related to the probability of firms being targeted by activist investors (e.g., Brav et al., 2008; Gantchev et al., 2013).[32] Panel A of Table 8 reports the results of the probit estimation for the selection equation (7), which is the first stage of the endogenous switching regression model. We find that ceteris paribus larger, fast growing firms with higher R&D investment (scaled by total assets), higher Tobin's Q, and higher leverage are less likely to be targeted. These results are consistent with view that activist investors target firms with relatively poor economic prospects and higher agency costs (Servaes and Tamayo, 2013). It is also seen that firms are less likely to be targeted if they are located in concentrated industries and when the cost of capital is high (as measured by the credit spread). On the other hand, firms are more likely to be targeted if they are followed by a greater number of analysts and have higher institutional ownership; the latter finding is consistent with the literature (Gantchev et al., 2013). Next, panel B reports the estimation of Equations (6)-(9), i.e., the second stage of the model. Ceteris paribus, the market shares and markups of target and peer firms are positively associated with size, profitability and internal liquidity, but are negatively associated with leverage. Higher costs of capital raise market shares and markups for targets and peer firms, presumably by raising the costs of entry. Interestingly, market shares and mark ups of peer firms and targets have an opposing relation to industry competition.

Using the estimated models given in Table 8, we report the answers to the "what if" questions in Table 9. Panel A reports the average δ (cf. equation (11)) for target firms' market shares and

[32] While identification is often an issue in simultaneous equations models, because of the non-linear form of selection bias control terms, the endogenous switching model can be identified even if the exogenous variables in Equations **(8)-(9)** are identical.

price-cost markups. Thus, we see the *actual* change in target market shares (or markups) from one year before to three years after the activist investor intervention, and we can compare this with estimated change if these firms had not been targeted. For example, the actual change in average target market share (expressed in percentage terms) is 4.5%, while the counterfactual change is close to zero. The two-sample Kolmogorov-Smirnov (KS) tests for the equality of the actual and hypothetical distributions are rejected at 1% confidence levels. Similarly, while the actual change in markups is 0.054, the hypothesized change in the absence of HFA is only 0.018; and, again, the difference between the actual and the hypothesized outcome distributions is highly significant. Meanwhile, panel B presents the average δ for the rival firms. Here, we see a *negative* δ (for both market shares and markups) — that is, the actual change in market shares and markups on average for the rival firms is significantly lower than the estimated change under the 'counterfactual' where the target firm would not have obtained the benefit of HFA. Here also the null hypothesis of no difference(s) between the actual and hypothesized distribution of outcomes can be rejected at 1% confidence levels.

In untabulated results we confirm that the effects of HFA depend on the nature of the proposals. Specific strategic alternatives have the most economically significant effects, raising target markets shares and price markups between the year prior to and the third after the initiation of activism. Activism that includes capital structure related proposals also has significant effects, but HFA focused on firm governance changes has marginally significant effects.

In sum, the analysis in this section shows that HFA leads to significant increases in target market shares and price-cost markups. The results are consistent using three different estimation methodologies: industry fixed effects with robust standard errors; quasi-natural experiment based on exogenous reductions in industry level tariffs; and, endogenous switching regressions. The results in this section complement the analysis of announcement effects on rivals in Section 5.1 in terms of firm-specific characteristics that are conducive — or detrimental — with respect to the benefits of HFA on market shares and profits: Targets that are likely to be financially constrained due to high leverage and/or low internal liquidity are significantly disadvantaged in benefiting from HFA, similar to the relatively large negative announcement effects for financially constrained rivals.

As we mentioned above, while ceteris paribus the benefits of HFA on target output and profits appear to be greater in less concentrated (or more competitive) industries, the negative announcement effects (of HFA) on rival firms is higher in more concentrated industries (cf. Tables 3 and

4). However, these findings are not necessarily in conflict, as we explicated in the Introduction. To reiterate, the fact that the announcement effects on the stock prices of rivals is greater in more concentrated industries (seen in Tables 3 and 4) is consistent with the notion that competition tends to eliminate managerial slack (Giroud and Mueller, 2010, 2011). Meanwhile, the analysis in Tables 6 and 7 examines the *magnitude* of improvement in target firms' outputs and profits following the initiation of HFA, which is positively related to depend on the elasticity of demand functions at the firm level thyat are likely to be greater in more competitive industries (Raith, 2003). Thus, our results with respect to the relation of industry concentration to post-HFA target improvements in outputs and profits complement Brav et al. (2013) who find similar results, but using a different data set.

Overall, our analysis in Tables 3-8 suggests that activist investors intervene to improve the economic and financial performance of target firms to enhance or protect the expected returns on their investments. Target under-performance may be due to managerial and operational inefficiencies, which are most likely to exist in noncompetitive industries. Target under-performance may also be threatened by industry-wide structural changes or competitive shocks, such as due to sudden reductions in industry level tariff protections.

6.3 Robustness of Results

In Table 10, we present the results of a variety of robustness checks on the results in Tables 6-7 using alternative estimation methodologies. For brevity, we report only the estimates of the coefficient on *Target*PostActivism* (i.e., β_3 in equation (5)). Panel A uses the treatment effects model that controls for any form of self-selection due to unobservable factors. Panel B uses the sample of targets (treated group) and matched rivals (control group), where we match each target firm to a control firm with the closest propensity score (Rosenbaum and Rubin, 1983, 1985) based on the size, market-to-book, leverage, ROA, Tobin's Q and cash holdings. We also force matches to be in the same four-digit SIC industry at the same time-period. The performance of the matching methodology depends on the ability to select rival firms' controls most closely match with target firms in terms of propensities scores. Figure 3 illustrates the performance of our matching methodology and shows that we have achieved this objective in our construction of the rival control groups. Panel C uses industry adjusted (based on 4-digit SIC classification) dependent and control variables; Panel D (E) adds industry sales (productivity) shocks which is calculated as the absolute value of the

difference between a particular industry's sales (TFP) growth and the average sales (TFP) growth across all four-digit SIC industries. In Panel E, TFP is calculated using Model 4 in Table A.1. The results are significantly positive for all methods and similar in magnitude to those shown in Tables 6 and 7.

We also perform robustness analysis by using the deviation between the actual post-HFA and predicted market shares and markups for industry peer firms, following an approach similar to that utilized by Servaes and Tamayo (2013). If the strong post-HFA performance of target firms' market share and markup relative to peer firms simply reflected a continuation in industry trend that started before investor intervention, then we would *not* expect superior performance of the rival firms (with respect to market shares and markups) in the years immediately preceding the HFA initiation on targets. To examine this, we estimate two regression models annually for all firms on Compustat *excluding* the firms in our sample. (These models employ market shares and markups as their dependent variables.) The targets and the peer firms are excluded only from two years prior to two years after the HFA event. Using the coefficients from these models, we then compute the predicted market shares and markups for rival firms for the period immediately preceding the HFA event (year -2 to year -1) and compare the predicted values with the actual performance. The results are reported in panel F of Table 10. The rival firms in our sample actually have significantly *higher* market shares and price-cost markups indicating that their relatively poor competitive performance after activist investor intervention on target firms is unlikely to reflect the continuation of an industry trend that started before the HFA event.

We need to also consider the implications of delisting of target firms because of being acquired, or going private. The attrition rate in our sample is 15.9%, which is comparable to the average attrition rate of the typical Compustat firm (see Brav et al., 2013) and significantly lower than the 25.5% attrition rate in the HFA sample of Brav et al. (2013). However, the attrition from delisting is unlikely to induce a positive survivorship bias in our results because, as seen in Table 2, target firms are on average more profitable and have higher earnings and cash flows compared with their peer firms. Indeed, Brav et al. (2008) and Brav et al. (2013) find a negative survivorship bias in their HFA samples — that is, restricting attention to continually listed targets tends to underestimate the positive effects of HFA.

7 Effects on Customers and Suppliers

Similar the analysis in Section 5.1, in this section we examine the announcement effects — and their determinants — of HFA on target firms' suppliers and customers.

7.1 Announcement Effects

The theoretical predictions regarding the possible effects of HFA on the customers and suppliers tend to be ambiguous because they depend on the distribution of bargaining power along the supply chain (cf. Table 1). Consistent with this, Table 11 (panel A.I) shows that, overall, the announcement effects of HFA on the abnormal returns of customers and suppliers are statistically insignificant. In general, the typical supplier and customer of targets may not be sufficiently economically dependent on (or connected to) on them for the initiation to HFA have significant impact on its (the supplier's or customer's) stock return, or the positive and negative effects of improved target efficiency may balance each other.

However, the results in panels A.II and A.III confirm the hypothesis that the net effect of target HFA on their customers and suppliers depends on the distribution of bargaining power. We find that the supply-chain firms have significantly negative abnormal returns when they are in more competitive (or less concentrated) markets (panel A.II) or when there is greater supply-chain dependency (cf. Section 4.2), as seen in panel A.III. On the other hand, customer firms in more concentrated downstream firms have significantly positive announcement effects. Moreover, the differences in the HFA announcement effects on the high versus low competition or the high versus low dependency are statistically significant.

7.2 Cross-Sectional Tests

In panel B of Table 11, we perform a cross-sectional analysis of the determinants of abnormal announcement returns for supplier and customer firms. Similar to the cross-sectional analysis of announcement effects on rival firms,we follow Gormley and Matsa (2013) and use year and industry fixed-effects, report robust standard errors clustered at the industry level.

There is a significant negative impact of target HFA on more levered suppliers and customers — that is, stockholders of financially weak firms in targets' vertical value chain appear to suffer significantly from target HFA. On the other hand, customers with higher internal cash assets or those located in more concentrated industries have more positive announcement effects. Indeed, both

suppliers and customers located in industries with above-median concentration have significantly higher announcement effects relative to those located in more competitive industries. Finally, customers and suppliers that are more dependent on the target, based on the measures SD_t and CD_t in (1)-(2), have significantly greater negative announcement effects.

Taken together, the results in Table 11 strongly support suggest that the impact of target HFA on their supply-chain firms depends on the relative bargaining power of these firms. Specifically, stockholders of suppliers or customers that are financially weak, or have greater economic dependence on the target, or are located in more competitive industries, suffer significantly negative announcement effects at the initiation of targets' HFA. This suggests that in evaluating the effects of HFA, financial markets incorporate the potential profit improvement of targets from increased rent-extraction from their weak (in the bargaining sense) suppliers and customers.

8 Summary and Conclusions

Shareholder activism is the most direct method for equity holders in large public companies to address the agency problems from the separation of ownership and control. Since the late 1990s hedge funds have become the dominant face of shareholder activism. In contrast to the results of the earlier institutional investor activism, hedge fund activism (HFA) appears to have effected significant financial and real effects on target firms. But in spite of intense interest by the media and policy makers, and recent scrutiny by academic economists, the product market spillover effects of HFA are poorly understood, even though these issues are fundamentally important in developing an overall perspective on the desirability and effectiveness of shareholder activism. Our analysis addresses these questions using a comprehensive sample of HFA that uniquely identifies the major horizontal and vertical product market relationships of target firms, and addresses the identification issues that arise from latent or unobservable industry-wide structural changes motivating activist investor intervention.

We find that HFA has an economically significant influence on product markets, both with respect to horizontal competition and vertical relationships (customers and suppliers). In particular, activism that focuses on demands for specific strategic actions and changes in capital structure improve the productive efficiency and competitive positioning of targets. In turn, these improvements have significantly negative effects on targets' competitive rival firms, who experience significant and continued reduction in profitability, cash flows, sales growth, R&D investment, and productivity

relative to the target firms. In contrast, target firms significantly increase their market shares and price-marginal cost markups, and the magnitude of these improvements are enhanced for firms that do not have binding financial constraints, or are located in more competitive industries. The negative effects of target HFA on rivals appear to be anticipated by the financial markets, because these firms suffer significantly negative announcement effects on their market-adjusted stock returns at the initiation of HFA on target firms. Moreover, these negative announcement effects are aggravated for rivals that are financially constrained, or have managerial slack due to location in noncompetitive industries. Finally, shareholders of targets' upstream or downstream firms with relative weak bargaining positions, because of being located in competitive industries or having higher economic dependency on targets, suffer significant wealth loss at the onset of HFA on targets.

Our analysis documents the significant effects of HFA on the stockholder wealth and operating performance of the product market players associated with the target firms, while also clarifying the main *channels* for the effects of shareholder activism on product markets. The results extend and reinforce emerging evidence that, possibly because of their unregulated status and high-powered managerial incentives, hedge funds are successful in generating economically significant real and financial effects, in marked contrast to the effects of earlier attempts at shareholder activism.

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Table 1: Summary of Theoretical Predictions

This table summarizes the predictions of the various hypotheses regarding the effects and signs of announcement abnormal returns to target firms and their rivals, customers, and suppliers.

Hypothesis	Productive Efficiency	Improved Competitive Strategy	Strategic Bargaining	Capital Structure Changes
Target	*Positive* Higher operating efficiency and asset turnover improve profits	*Positive* Higher market share and price markups from improved competitive positioning Higher monopolistic rents from collusion	*Positive* Lower input costs and higher output prices	*Ambiguous* Reduction in free cash flow agency costs and hedge fund financial support improves competitive position But financial fragility can lead to weaker competitive position
Rivals	*Ambiguous* *Negative*: Lower profits from competing against a more efficient firm *Positive*: Information on more efficient production, marketing, distribution, and governance	*Ambiguous* *Positive:* Higher monopolistic rents from collusion *Negative:* Reduced market share and profits from improved competitive positioning or strategy of the target firm	*Non-Positive* Unaffected or negatively affected by the superior competitive position of the target firm	*Positive* Benefit from the weaker competitive position of the target firm
Customers	*Non-negative* Unaffected or lower prices if efficiency gains are passed in the form of lower prices	*Ambiguous* *Positive:* Better price-quality offers from target due to improved competitive positioning *Negative*: Higher prices from improved entry deterrence and collusion by upstream firms	*Non-Positive* Higher prices charged by the target firm if customer has low bargaining power	*Non-Positive* Target may be forced to raise prices and cut back services
Suppliers	*Ambiguous* *Non-Negative:* Unaffected or benefit from higher demand from target's increased market share *Negative:* Loss of business or bargaining power due to efficiency gains of target	*Ambiguous* *Positive:* Benefit by extracting some of the surplus from the higher profits of downstream firms *Non-Positive:* Unaffected or suffer from reduced downstream demand if collusion lowers industry output	*Non-Positive* Lower prices and other costly benefits extracted by the target firm if the supplier has lower bargaining power	*Negative* Higher survival and credit risk of the target and lower demand for inputs

Table 2: Descriptive Statistics for Targets, Rivals, Customers, and Suppliers

The following table displays the various characteristics of target firms and their industry peer firms (rivals, customers and suppliers). In Panel A, *EBITDA* is the ratio of earnings before interest, taxes, depreciation and amortizations scaled by total assets, *MV of Equity* is market capitalization in millions of dollars, *Market-to-Book* is the ratio of market to book value of equity, *Growth* is the growth rate in sales, *Leverage* is the market leverage ratio defined as the ratio of debt to market value of equity, *Payout* is the ratio of total dividends divided to net income before extraordinary items, *CashFlow* is the cash flow defined as the sum of net income, depreciation scaled by total assets. *Supplier Dependency* on customers targeted by hedge funds is calculated as the percentage of a supplier's total sales that are accounted for by the target firm (cf. Equation (1) in the text). *Customer Dependency* on suppliers targeted by hedge funds is calculated as the percentage of a customer's cost of goods sold that is accounted for by purchases from the target firm (cf. Equation (2) in the text).

Panel A: Firm-Specific Characteristics

	Targets		Rivals		Suppliers		Customers	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
MV of Equity	681.53	163.55	925.19	476.5	642.76	120.00	6,382.6	1,141.0
Payout	0.255	0.000	0.422	0.000	0.182	0.000	0.424	0.000
Growth	0.069	0.050	0.085	0.069	0.047	0.060	0.095	0.070
Leverage	0.379	0.352	0.285	0.420	0.400	0.352	0.513	0.422
CashFlow	0.028	0.034	0.015	0.017	0.013	0.006	0.052	0.046
Market-to-Book	1.320	1.231	1.529	1.017	1.008	1.576	1.613	1.997
ROA	0.049	0.072	0.026	0.032	0.009	-0.019	0.067	0.040
EBITDA	0.078	0.083	0.041	0.030	0.028	0.007	0.084	0.092
Supplier Dependency					0.227	0.188		
Customer Dependency							0.042	0.011

Table 2 (continued): Descriptive Statistics for Targets, Rivals, Customers, and Suppliers

This panel shows the percentage of rival, customer and supplier firms in our sample per two-digit Standard Industry Classification (SIC) codes.

Panel B: Industry Distribution

2-digit SIC Bracket	Industry	Rivals	Suppliers	Customers
01-09	Agriculture	2.03%	0.38%	0.64%
10-14	Mining	3.60%	1.39%	2.25%
15-17	Construction	2.18%	2.96%	4.67%
20-39	Manufacturing	27.33%	29.04%	35.10%
40-49	Transportation*	9.98%	10.21%	15.94%
50-51	Wholesale trade	16.29%	21.42%	17.23%
52-59	Retail trade	15.39%	16.32%	12.72%
60-67	Finance, Insurance & Real estate	17.87%	12.41%	6.12%
70-89	Services	5.33%	5.86%	5.31%

Table 3: Announcement Effects on Rivals around Hedge Fund Activism Filings

Panel A of the table presents market-adjusted mean excess stock returns for full sample (Panel A.I) and for different groups segmented by the purpose of hedge fund activity (Panel A.II). Panel B provides benchmark-adjusted mean excess stock returns by rivals' leverage (Panel B.I) and cash holdings (Panel B.II), and target's industry concentration (Panel B.III). We define a target's rivals as all firms with the same four-digit Standard Industry Classification (SIC) code. Rivals that are subject to a hedge fund activism in the subsequent three years and those without complete data on the CRSP Daily Returns file are not included in the sample. There are total 45,080 rival firms in our sample. We measure abnormal returns within the event window of [-5,+5] where day 0 is the initial Schedule 13D filing date by hedge fund activists. The abnormal return of each rival *i* for each day *t,* is computed as $AR_{it} = R_{it} - R_{mt}$ where R_{it} is the daily return of the rival *i*, R_{mt} is the return on the CRSP equally-weighted or value-weighted market index for day *t*. The specific type of targeting is based on the purpose of the activism and covers governance-related issues, strategic alternatives, and capital structure related issues as described in the text. All filings under '*General*' category (925 events) reveal no specific agenda (include only general statements of maximizing shareholder value). '*Corporate Governance*' category (281 events) includes proposals to rescind the poison pill, to replace the CEO or the chairman, or to cut the salary of the CEO, all proposals where the hedge fund asks for a board seat and nominates someone to the board of directors. It also includes proposals to change the board of directors' composition, to add an independent member or to declassify the board. '*Strategic Alternatives*' (358 events) include proposals to put itself up for sale, to sell some or part of its assets, to spin-off, or to merge with another company, proposals where the hedge fund makes a purchase offer, etc. '*Capital Structure*' category (198 events) includes all proposals to pay special dividend to shareholders, equity issuances, share repurchases, etc. Also, it includes proposals where the hedge fund opposes the reorganization plan of the firm or opposes the share offering. Number of rivals *(R)* used in each subsample is provided in brackets. Target's industry concentration is determined by the Herfindahl-Hirschman index (*HHI*). The *HHI* is calculated as the sum of squared market shares of each company within an industry. *Leverage* is the market leverage and *Cash* is the cash-to-assets ratio for the rivals. Level of significance is calculated using the clustered standard errors at the industry level and provided in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Table 3 (Cont'd): Announcement Effects on Rivals around Hedge Fund Activism Filings

			(1) Equally-weighted *EW* $CAR_{[-5,+5]}$	(2) Value-Weighted *VW* $CAR_{[-5,+5]}$
Panel A: CARs by Activism Characteristics				
Panel A.I: Full Sample *[R: 45,080]*			-1.82%**	-1.75%**
Panel A.II: Segmented by Objective				
General *[R: 25,900]*			-1.49%*	-1.42%*
Specific *[R: 19,180]*			-2.27%**	-2.22%**
[R: 7,056]		Governance	0.62%	-0.65%
[R: 8,456]		Strategic	-3.68%***	-3.59%***
[R: 3,668]		CapStructure	-2.14%**	-2.11%**
		General-Specific	0.78%	0.80%
		General-Governance	-0.87%	-0.77%
		General-Strategic	2.19%**	2.17%**
		General- CapStructure	0.65%	0.69%
Panel B: CARs by Firm and Industry Characteristics				
Panel B.I: Leverage				
[R: 22,259]	*(High)*	Leverage $\geq q50$	-2.76%**	-2.67%**
[R: 22,821]	*(Low)*	Leverage $\leq q50$	-0.88%	-0.85%
		High-Low	-1.88%*	-1.82%*
Panel B.II: Cash				
[R: 23,744]	*(High)*	Cash $\geq q50$	-0.84%	-0.85%
[R: 21,336]	*(Low)*	Cash $\leq q50$	-2.92%**	-2.74%**
		High-Low	2.08%**	-1.89%*
Panel B.III: Industry Concentration				
[R: 21,532]	*(High)*	HHI $\geq q50$	-2.95%**	-2.84%**
[R: 23,548]	*(Low)*	HHI $\leq q50$	-0.78%	-0.76%
		High-Low	-2.17%**	-2.08%**

Table 4: Cross-sectional Regression Analysis of Hedge Fund Activism Filings on Rivals

This table presents the relation between (value weighted) abnormal returns $VW\,CAR_{[-5,+5]}$ and a set of explanatory variables within the event window of [-5,+5] for the rivals of target firms. All variables are retrieved from the year prior to the event year. *LnSize* is the logarithm of market capitalization , *Leverage* is the market leverage, and *Cash* is the ratio of cash-to-assets. The *HHI* is calculated as the sum of squared market shares of each company within an industry. Intercept is suppressed to avoid perfect multicollinearity. *Target HHI* $\geq q50$ is a dummy equal to one if a target operates in an industry whose HHI is above the sample median. Unreported controls include market-to-book, return on assets, dividend payout dummy and sales growth. We scale the coefficient estimates by the standard deviation to ease the interpretation and comparison of the estimates. Level of significance is calculated using the heteroskedasticity robust standard errors (clustered at the industry level) and provided in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Panel A: Activism Type and Target Characteristics

	(1A)		(2A)		(3A)		(4A)	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
LnSize	0.329*	(1.69)	0.305	(1.55)	0.277	(1.39)	0.210	(1.27)
Leverage	-0.914**	(-2.24)	-0.902**	(-2.19)	-0.897**	(-2.05)	0.856*	(1.88)
Cash	0.840*	(1.86)	0.781*	(1.90)	0.808*	(1.93)	0.986*	(1.96)
General	-1.002*	(-1.99)	-0.877*	(-1.88)	-0.744*	(-1.80)	-0.722*	(-1.76)
Governance	0.479	(1.58)	0.416	(1.55)	0.327	(1.42)	0.316	(1.26)
Strategic	-2.866***	(-2.75)	-2.735***	(-2.70)	-2.380***	(-2.63)	-2.134**	(-2.52)
CapStructure	-1.828**	(-2.30)	-1.766**	(-2.12)	-1.724**	(-2.04)	-1.530*	(-1.92)
Leverage × Governance			-0.886*	(-1.73)				
Cash × Governance			0.505	(1.60)				
Leverage × Strategic					-1.108*	(-1.85)		
Cash × Strategic					0.870*	(1.78)		
Leverage × CapStructure							-0.919*	(-1.60)
Cash × CapStructure							0.703	(1.51)
Adj. R-squared	0.064		0.069		0.064		0.066	
Number of obs.	39,358		39,358		39,358		39,358	
Other controls	Yes		Yes		Yes		Yes	
Industry fixed-effects	Yes		Yes		Yes		Yes	
Year fixed-effects	Yes		Yes		Yes		Yes	
Clustered standard errors	Yes		Yes		Yes		Yes	

Table 4 (Cont'd): Cross Sectional Regression Analysis of Hedge Fund Activism Filings on Rivals

Panel B: Industry Characteristics

	(1B)		(2B)		(3B)	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
LnSize	0.228	(1.25)	0.205	(1.14)	0.188	(1.10)
Leverage	-1.019***	(-2.14)	-0.827**	(-2.05)	-0.766*	(-1.87)
Cash	-0.692	(-1.55)	-0.688*	(-1.46)	-0.610	(-1.35)
General	-0.927*	(-1.87)	-0.876*	(-1.69)	-0.802	(-1.55)
Governance	0.350	(0.88)	0.309	(0.85)	0.215	(0.74)
Strategic	-2.886**	(-2.05)	-2.201*	(-1.96)	-1.974*	(-1.80)
CapStructure	-1.299*	(-1.84)	-1.105*	(-1.77)	-1.076*	(-1.69)
HHI	-0.911*	(-1.97)	-0.865*	(-1.85)	-0.822*	(-1.79)
Target HHI $\geq q50$			-2.906***	(-2.66)	-2.772**	(-2.47)
HHI × Governance					-0.235	(-1.04)
HHI × Strategic					-0.899*	(-1.70)
HHI × CapStructure					-0.605*	(-1.72)
Adj. R-squared	0.056		0.061		0.060	
Number of obs.	39,358		39,358		39,358	
Other controls	Yes		Yes		Yes	
Industry fixed-effects	Yes		Yes		Yes	
Year fixed-effects	Yes		Yes		Yes	
Clustered standard errors	Yes		Yes		Yes	

Table 5: Operational Performance of Rivals after Hedge Fund Activism

This table displays the real effects of hedge fund activism on the rivals of target firms in relative terms, i.e., rival performance in excess of target performance in the post-activism period. Holding fixed a target firm, we estimate the following specification for the typical rival firm:

$$y_{it} = \alpha + \sum_{j=0}^{3} \beta_j Activism_{t-j} + \beta_6 Activism_{t-n} + u_i + d_t + \varepsilon_{it}$$

where u_i and d_t are the firm- and year-specific effects, respectively; $Activism_{t-j}$ are dummy variables equal to 1 if year *t- j* was the hedge fund activism (HFA) year; $Activism_{t-n}$ is a dummy variable set to 1 if the HFA took place more than 3 years before. Rivals are formed from other companies in the same four-digit SIC industry group and those that are subject to a hedge fund activism in the subsequent three years are not included in the sample. By using a fixed effect model, we use each company before the HFA as a control for itself. *EBITDA* is the ratio of earnings before interest, taxes, depreciation and amortizations scaled by total sales, *CashFlow* is the cash flow defined as the sum of net income, depreciation scaled by total sales. *CAPEX* is capital expenditures over property, plant and equipment. *RND* is the research and development expenditures over total assets. *TFP* is total factor productivity estimated from Model 4 of Table A.1. The table reports only the coefficient on HFA dummy variables. Heteroskedasticity-robust standard errors are clustered at the industry level. The last column reports the *p*-value of an *F*-test of the hypothesis that the sum of the coefficients all post-activism dummies are equal to zero. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

	Year 0	Year +1	Year +2	Year +3	Year >+3	*F*-stat (*p*-value)
ROA	0.004	-0.008	-0.014*	-0.013*	-0.019**	0.021
	(1.18)	(-1.28)	(-1.88)	(-1.85)	(-2.07)	
EBITDA	0.001	-0.003	-0.011*	-0.024**	-0.027**	0.011
	(1.11)	(-1.20)	(-1.70)	(-2.21)	(-2.40)	
CashFlow	-0.000	-0.006	-0.017*	-0.020**	-0.028**	0.008
	(-1.08)	(-1.55)	(-1.96)	(-2.08)	(-2.47)	
Growth in Sales	0.021*	-0.027**	-0.064***	-0.103***	-0.144***	0.000
	(1.96)	(-2.10)	(-3.20)	(-3.77)	(-4.59)	
CAPEX	0.002	-0.001	-0.008	-0.009	-0.010	0.127
	(1.17)	(-1.12)	(-1.55)	(-1.59)	(-1.63)	
RND	-0.000	-0.002	-0.013*	-0.018*	-0.014*	0.088
	(-1.10)	(-1.18)	(-1.80)	(-1.99)	(-1.86)	
TFP	0.003	-0.004	-0.017*	-0.035***	-0.042***	0.000
	(1.12)	(-1.20)	(-1.95)	(-2.82)	(-2.98)	

Table 6: The Impact of Hedge Fund Activism on Market Shares of Targets

Panel A of this table presents results of regressions examining the effect of hedge fund activism on market share (*MarketShare)*. *Target* is a dummy that takes a value of one for firms targeted by an activist hedge fund in a given year. *PostActivism* is a dummy variable that takes a value of one after the HFA event. To isolate the effect of the event stemming from HFA, we restrict our sample to one year before and three years after the HFA. Panel B regressions examine the effect of HFA on market share (*MarketShare)* following large reductions in import tariffs. Tariff reductions (*CUT*) occur when an industry-year change in tariff rate (ΔT) is negative 3 times larger than its median value. For this definition, *CUT*=1 if an industry had experience a tariff cut in the *t* and *t-1* before the hedge fund activism. *Leverage* is defined as total debt (long-term debt plus debt in current liabilities), divided by the market value of assets, *ROA* is the return of assets, *Cash* is cash-to-assets; *HHI* is the Herfindahl-Hirschman index and calculated as the sum of squared market shares of each company within an industry. Unreported controls include *LnSize* is defined as the natural log of the value of the target; *Growth* is the growth rate of sales over the previous year. is R&D scaled by lagged assets; *ROA* is the return of assets; A*nalyst* is the number of analysts covering the company from I/B/E/S; T*obin's Q* is defined as (book value of debt + market value of equity)/(book value of debt + book value of equity); *Credit Spread* is the difference between the yields of BB- versus AAA-rated corporate bonds obtained from Bloomberg. All variables are retrieved from the year prior to the event year. We scale the coefficient estimates by the standard deviation to ease the interpretation and comparison of the estimates. The estimations correct the error structure for heteroskedasticity and are clustered at the industry level. We report *t*-statistics in brackets. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Panel A: Benchmark estimations — *Dependent variable: MarketShare*

	(1) Baseline results		(2) Leverage effects		(3) Cash effects		(4) Competition effects	
Target × PostActivism	0.037**	(2.11)	0.040**	(2.26)	0.045**	(2.35)	0.047**	(2.40)
Target × Leverage× PostActivism			-0.010	(-1.60)				
Target × Cash× PostActivism					0.019*	(1.92)		
Target × HHI× PostActivism							-0.016*	(-1.78)

Panel B: Quasi-natural experiment — *Dependent variable: MarketShare*

	(1) Baseline results		(2) Leverage effects		(3) Cash effects		(4) Competition effects	
Target × PostActivism× CUT	0.048***	(3.19)	0.051***	(3.33)	0.046***	(3.02)	0.039***	(2.85)
Target × Leverage× PostActivism× CUT			-0.007	(-1.42)				
Target × Cash× PostActivism× CUT					0.024**	(2.16)		
Target × HHI× PostActivism× CUT							-0.010*	(-1.69)
Year fixed effects	Yes		Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes		Yes	
Pre-event dummies (t-1,t-2,t-3)	Yes		Yes		Yes		Yes	
Other controls	Yes		Yes		Yes		Yes	
Clustered standard errors	Yes		Yes		Yes		Yes	

Table 7: The Impact of Hedge Fund Activism on Price-Cost Markups of Targets

Panel A of this table presents results of regressions examining the effect of hedge fund activism on markups (*Markup)*. Firm-specific and time-varying markups are estimated for each sample firm using Model 4 of Table A.1. *Target* is a dummy that takes a value of one for firms targeted by an activist hedge fund in a given year. *PostActivism* is a dummy variable that takes a value of one after the HFA event. To isolate the effect of the event stemming from HFA, we restrict our sample to one-year before and three years after the HFA. Panel B regressions examine the effect of HFA on markups (*Markup*) following large reductions in import tariffs. Tariff reductions (*CUT*) occur when an industry-year change in tariff rate is negative 3 times larger than its median value. For this definition, *CUT*=1 if an industry had experience a tariff cut in the *t* and *t-1* before the hedge fund activism. *Leverage* is defined as total debt (long-term debt plus debt in current liabilities), divided by the market value of assets, *ROA* is the return of assets, *Cash* is cash-to-assets; *HHI* is the Herfindahl-Hirschman index and calculated as the sum of squared market shares of each company within an industry. Unreported controls include *LnSize* is defined as the natural log of the value of the target; *Growth* is the growth rate of sales over the previous year. is R&D scaled by lagged assets; *ROA* is the return of assets; A*nalyst* is the number of analysts covering the company from I/B/E/S; T*obin's Q* is defined as (book value of debt + market value of equity)/(book value of debt + book value of equity); *Credit Spread* is the difference between the yields of BB- versus AAA-rated corporate bonds obtained from Bloomberg. All variables are retrieved from the year prior to the event year. We scale the coefficient estimates by the standard deviation to ease the interpretation and comparison of the estimates. The estimations correct the error structure for heteroskedasticity and clustered at the industry level. We report *t*-statistics in brackets. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Panel A: Fixed effects estimations — *Dependent variable: Markup*

	(1) Baseline results		(2) Leverage effects		(3) Cash effects		(4) Competition effects	
Target × PostActivism	0.062***	(2.65)	0.060**	(2.48)	0.058**	(2.29)	0.065***	(2.76)
Target × Leverage × PostActivism			-0.017*	(-1.68)				
Target × Cash × PostActivism					0.010	(1.52)		
Target × HHI × PostActivism							-0.022*	(-1.90)

Panel B: Quasi-natural experiment — *Dependent variable: Markup*

	(1) Baseline results		(2) Leverage effects		(3) Cash effects		(4) Competition effects	
Target × PostActivism × CUT	0.057**	(2.27)	0.062***	(2.58)	0.058**	(2.33)	0.061***	(2.52)
Target × Leverage × PostActivism × CUT			-0.021*	(-1.89)				
Target × Cash × PostActivism × CUT					0.018*	(1.72)		
Target × HHI × PostActivism × CUT							-0.025*	(-1.94)
Year fixed effects	Yes		Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes		Yes	
Pre-event dummies (t-1,t-2,t-3)	Yes		Yes		Yes		Yes	
Other controls	Yes		Yes		Yes		Yes	
Clustered standard errors	Yes		Yes		Yes		Yes	

Table 8: The Effects of HFA on Market Shares and Markups: Switching Regressions

This table presents the probit estimation results for the selection equation given in Equation XX, where dependent variable is a binary variable that equals one if a firms is subject to HFA, and zero otherwise. All variables are retrieved from the year prior to the event year. *LnSize* is defined as the natural log of the equity value of the target; *Growth* is the growth rate of sales over the previous year. *Leverage* is book leverage, defined as total debt (long-term debt plus debt in current liabilities), divided by the book value of assets. *InstOwner* is the percentage of firm shares held by institutional investors; *ROA* is the return of assets; A*nalyst* is the number of analysts covering the company from I/B/E/S; *Cash* is the cash-to-assets. *HHI* is the Herfindahl-Hirschman index calculated as the sum of squared market shares of each company within an industry. *RND* is R&D scaled by lagged assets; Tobin's Q is defined as (book value of debt + market value of equity)/(book value of debt + book value of equity); *Credit Spread* is the difference between the yields of BB- versus AAA-rated corporate bonds obtained from Bloomberg. *, ** and *** indicate significance at the 10%, 5% and 1% levels.

Panel A: First Stage Results of Endogenous Switching Model

	Marginal Effect	Pr>ChiSq
LnSize	-0.010**	(0.04)
Growth	-0.018**	(0.02)
Leverage	-0.022***	(0.00)
InstOwner	0.067***	(0.00)
ROA	0.595***	(0.00)
Analysts	0.011*	(0.03)
HHI	-0.408***	(0.00)
RND	-0.084***	(0.00)
Tobin's Q	-0.017*	(0.06)
Credit Spread	-0.005*	(0.10)
Model *p*-value (Likelihood Ratio Test)	0.006	

Table 8 (Continued) The Effects of HFA on Market Shares and Markups: Switching Regressions

This table reports estimation results for the two second-stage outcome equations, one for the target group and the other for the rival group. All variables are retrieved from the year prior to the event year. *LnSize* is defined as the natural log of the equity value of the target; *Leverage* is defined as total debt (long-term debt plus debt in current liabilities), divided by the market value of assets. *Growth* is the growth rate of sales over the previous year. *HHI* is the Herfindahl-Hirschman index calculated as the sum of squared market shares of each company within an industry. *RND* is R&D scaled by lagged assets; *ROA* is the return of assets; *Cash* is the cash-to-assets. A*nalyst* is the number of analysts covering the company from I/B/E/S; Tobin's Q is defined as (book value of debt + market value of equity)/(book value of debt + book value of equity); *Credit Spread* is the difference between the yields of BB- versus AAA-rated corporate bonds obtained from Bloomberg. *, ** and *** indicate significance at the 10%, 5% and 1% levels.

	Panel B: Second Stage Results of Endogenous Switching Model							
	Target firms				Rival firms			
	MarketShare		*Markup*		*MarketShare*		*Markup*	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
LnSize	0.066***	(2.54)	0.045**	(2.44)	0.032**	(2.13)	0.020**	(2.02)
Leverage	-0.016*	(-1.77)	-0.010	(-1.36)	-0.029**	(-2.14)	-0.048**	(-2.47)
Lagged MarketShare	0.028*	(1.98)	0.020*	(1.92)	0.011*	(1.72)	0.019**	(2.01)
Lagged Markup	0.010*	(1.72)	0.019*	(1.89)	0.008	(1.60)	0.002	(1.17)
Growth	0.012	(1.61)	0.014	(1.66)	0.010	(1.58)	0.019*	(1.74)
HHI	-0.046**	(-2.15)	-0.069***	(-2.66)	0.034**	(2.19)	0.037**	(2.25)
ROA	0.020*	(1.76)	0.015*	(1.68)	0.004	(1.16)	0.040**	(2.32)
Cash	0.016*	(1.82)	0.018**	(1.90)	0.022**	(2.04)	0.035**	(2.20)
Tobin's Q	0.005	(1.20)	0.003	(1.18)	0.001	(1.05)	0.006	(1.35)
Credit spread	0.011*	(1.71)	0.017*	(1.83)	0.018*	(1.91)	0.013*	(1.79)
Year fixed effects	Yes		Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes		Yes	
Pre-event dummies (t-1,t-2,t-3)	Yes		Yes		Yes		Yes	
Clustered standard errors	Yes		Yes		Yes		Yes	

Table 9: Counterfactual Analysis

The table reports the results of a "what-if" analysis based on the results of the switching regression model based on Section 6.1.3, and using the model estimates presented in Table A.2. Panel A reports actual change in *MarketShare* and *Markup* for target firms from one year before and three years after the intervention; *MarketShare* and *Markup* for target firms if they were not targeted by hedge fund activists. Panel B reports the differences in actual and hypothetical values for the rival firms. The final column performs two-sample Kolmogorov-Smirnov (KS) tests for the equality of the actual distribution and the hypothetical distribution.. *, ** and *** indicate significance at the 10%, 5% and 1% levels based on *p-values*.

	Actual	Hypothetical	KS test *p*-value (Actual-Hypothetical)
Panel A: Target firms			
MarketShare	0.045	-0.009	-6.015***
Markup	0.059	0.018	-5.076***
Panel B: Rival firms			
MarketShare	0.015	0.039	2.963***
Markup	0.027	0.057	3.325***

Table 10: Robustness Tests

Panels A-E of this table replicate Table 7 and 8 and report the results only for the coefficient on *Target* × *PostActivism* control variable. Additional control variables and fixed effects are defined in Tables 7 and 8. Panel A uses the treatment effects model that controls for any form of self-selection due to unobservable factors. Panel B uses the sample of targets (treated group) and matched rivals (control group) where we match each target firm to a control firm with the closest propensity score (Rosenbaum and Rubin (1983, 1985) based on the size, market-to-book, leverage, ROA, Tobin's Q and cash holdings. We also force matches to be in the same four-digit SIC industry at the same time-period. Panel C uses industry adjusted (based on 4-digit SIC classification) dependent and control variables; Panel D (E) adds industry sales (productivity) shocks which is calculated as the absolute value of the difference between a particular industry's sales (TFP) growth and the average sales (TFP) growth across all four-digit SIC industries. In Panel E, TFP is calculated using Model 4 in Table A.1. Panel F contains an analysis of the predicted market shares and markups. Two regression models are estimated annually for all firms on Compustat, except for the firms in our sample. The first model employs Market shares as the dependent variable. The second model employs total markups as the dependent variable. Independent variables are: LnSize, Leverage, Lagged MarketShare, Lagged Markup, Growth, HHI, ROA, Cash, Tobin's Q, Credit spread time and industry fixed effects. All test statistics are computed using standard errors that are robust to within industry correlation and heteroskedasticity. We use the estimated regression models to determine the levels of market share and markup for each firm, and compare it to the actual level for the peer firms in our sample in the period prior to the HFA. Statistical significance at the 10%, 5% and 1% levels are denoted by *, ** and ***, respectively.

Dependent variable:	*MarketShare*		*Markup*	
	Estimate	t-stat	Estimate	t-stat
Panel A: Treatment effects				
Target × PostActivism	0.041**	(2.27)	0.055**	(2.48)
Panel B: Propensity score matching				
Target × PostActivism	0.035**	(2.10)	0.062***	(3.01)
Panel C: Industry-adjusted				
Target × PostActivism	0.037**	(2.22)	0.051**	(2.38)
Panel D: Controlling for industry sales shocks				
Target × PostActivism	0.048***	(2.69)	0.066***	(3.45)
Panel E: Controlling for productivity shocks				
Target × PostActivism	0.039***	(2.76)	0.047**	(2.49)
Panel F: Deviations from predicted values	0.022**	(2.01)	0.030**	(2.33)
Actual peer values (year-2 to -1)				
- Predicted values for Compustat universe (year -2 to -1)				

Table 11: The Effects of Hedge Fund Activism Filing on Suppliers and Customers

Panel A of the table presents supplier and customer market-adjusted mean excess stock for full sample (Panel A.I), for different groups segmented the suppliers' or customers' industry concentration (Panel A.II); and by the dependency of suppliers and customers on the target firm (Panel A.III). We measure abnormal returns within the event window of [-5,+5] where day 0 is the initial Schedule 13D filing date by hedge fund activists. The abnormal return of each supplier (customer) *i* for each day *t*, is computed as $AR_{it} = R_{it} - R_{mt}$ where R_{it} is the daily return of the customer (supplier) *i*, R_{mt} is the return on the CRSP equally-weighted or value-weighted market index for day *t*. In Panel A.II , the *HHI* is calculated as the sum of squared market shares of each company within the supplier's (in columns 1 and 2) or customer's (in columns 3 and 4) industry . In Panel A.III, we use the customer dependency measure C*D* (see Equation (2) in the text) to rank customers above (below) median as strongly (weakly) dependent on their own suppliers. Strongly (weakly) dependent customers are those customers for which purchases from the supplier firm scaled by total cost of goods sold makes up the top (bottom) fifty percent of all scaled purchases by other customers of the supplier firm. Likewise, we use the supplier dependency measure *SD* (see Equation (2) in the text) to rank suppliers above (below) median as strongly (weakly) dependent on their own customers. Panel B of the table presents the relation between abnormal returns within the event window of [-5,+5] and a set of explanatory variables for the suppliers and customers of target firms. *Supplier Dependency* is the supplier dependency measure SD (cf. Equation (1) in the text) and *Customer Dependency* is the customer dependency measure *CD* (cf. Equation (2) in the text). *Supplier (Customer) HHI* $\geq q50$ is a dummy variable that takes a value of one if the supplier (customer) HHI is above the sample median. *Strong Supplier (Customer) Dependency* is a dummy that takes a value of one for the most dependent suppliers (customers). $HHI_{suppliers}$ and $HHI_{customers}$ are the industry concentration of the suppliers and customers, respectively. *General* is a dummy variable that takes a value of one for HFA with no specific agenda (include only general statements of maximizing shareholder value), 0 otherwise. *Leverage* is the market leverage and *Cash* is the cash-to-assets ratio for the suppliers (in columns 1 and 2) or customers (in columns 3 and 4). In Panel B, unreported controls include market-to-book, return on assets, dividend payout dummy and sales growth for the suppliers (columns 1, 2) or customers (columns 3, 4). We scale the coefficient estimates by the standard deviation to ease the interpretation and comparison of the estimates. Number of suppliers *(S)* and customers *(C)* used in each subsample is provided in brackets. Target's Level of significance is calculated using the clustered standard errors at the industry level and provided in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Panel A: Cumulative Abnormal Returns around the Activism Filing for Suppliers and Customers

		Suppliers		Customers	
		(1) Equally-weighted $EW\ \mathrm{CAR}_{[-5,+5]}$	(2) Value-Weighted $VW\ \mathrm{CAR}_{[-5,+5]}$	(3) Equally-weighted $EW\ \mathrm{CAR}_{[-5,+5]}$	(4) Value-Weighted $VW\ \mathrm{CAR}_{[-5,+5]}$
Panel A.I: Full sample					
		-0.81%	-0.75%	0.45%	0.44%
Panel A.II: Segmented by Industry Concentration					
[S:705], [C:307]	*(High)* $\mathrm{HHI}_{vertical} \geq q50$	0.17%	0.20%	1.22 %*	1.27%*
[S:802], [C:314]	*(Low)* $\mathrm{HHI}_{vertical} \leq q50$	-1.76%*	-1.68%*	-0.30%	-0.38%
	High-Low	1.93%*	1.88%*	1.52%*	1.65%*
Panel A.III: Segmented by Dependency on Target Firm					
[S:788], [C:315]	Strong	-1.46%*	-1.39%*	1.13%	1.02%
[S:799], [C:306]	Weak	-0.17%	-0.12%	-0.26%	-0.15%
	Strong-Weak	-1.29%*	-1.27%*	-1.39%*	-1.17%

Table 11 (Continued). The Effects of Hedge Fund Activism Filing on Suppliers and Customers

Panel B: Cross Sectional Analysis of Suppliers and Customers and Industry Characteristics

	Suppliers				Customers			
	(1)		(2)		(3)		(4)	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
lnSize	0.280	(1.39)	0.265	(1.22)	0.277	(1.57)	0.241	(1.44)
Leverage	-0.488**	(-2.14)	-0.476**	(-2.02)	-0.577**	(-2.23)	-0.485**	(-2.11)
Cash	0.305	(1.45)	-0.288	(-1.29)	0.322*	(1.76)	0.295*	(1.69)
General	0.412	(1.18)	0.403	(1.30)	-0.276	(-1.02)	-0.229	(-0.99)
$HHI_{suppliers}$	0.216	(1.44)						
$HHI_{customers}$					0.318*	(1.52)		
Supplier Dependency			-0.944*	(-1.87)				
Customer Dependency							-0.633	(-1.52)
Target $HHI \geq q50$	-0.855	(-1.50)			-0.529	(-0.93)		
$HHI_{suppliers} \geq q50$	1.007*	(1.78)						
Strong Supplier Dependency			-1.216*	(-1.86)				
$HHI_{customers} \geq q50$					0.677*	(1.90)		
Strong Customer Dependency							-0.810*	(-1.79)
Adj. R-squared	0.046		0.055		0.051		0.058	
Number of obs.	1,478		1,478		599		599	
Other controls	Yes		Yes		Yes		Yes	
Industry fixed-effects	Yes		Yes		Yes		Yes	
Year fixed-effects	Yes		Yes		Yes		Yes	
Clustered standard errors	Yes		Yes		Yes		Yes	

Figure 1

Timeline of Trian Fund's Activism in Heinz H.J. Co.

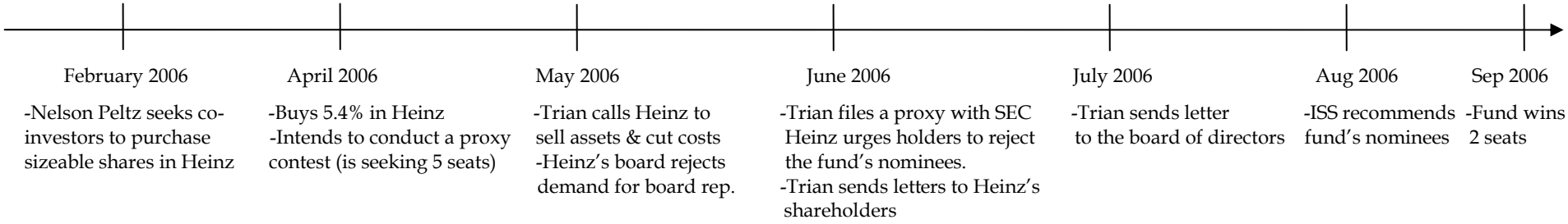


Figure 2

Cumulative Abnormal Returns of Rivals, Customers, and Suppliers of Targets Subject to Hedge Fund Activism

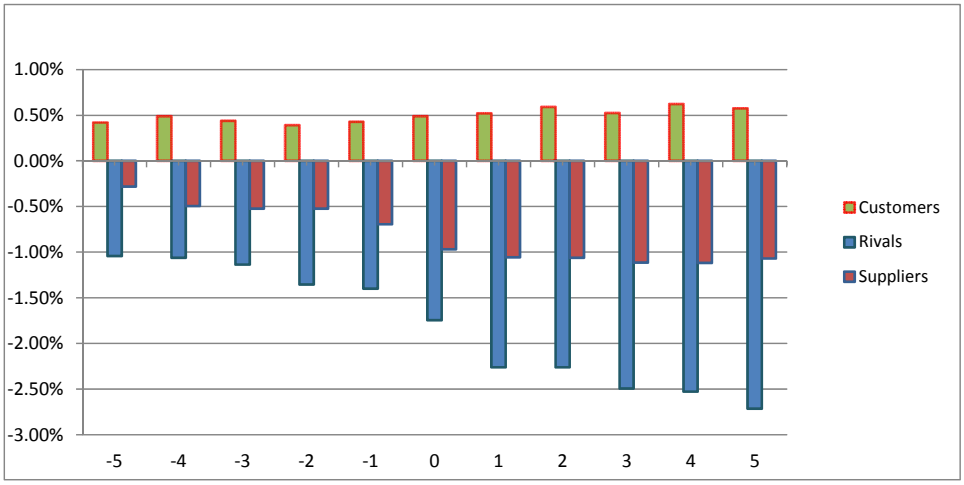
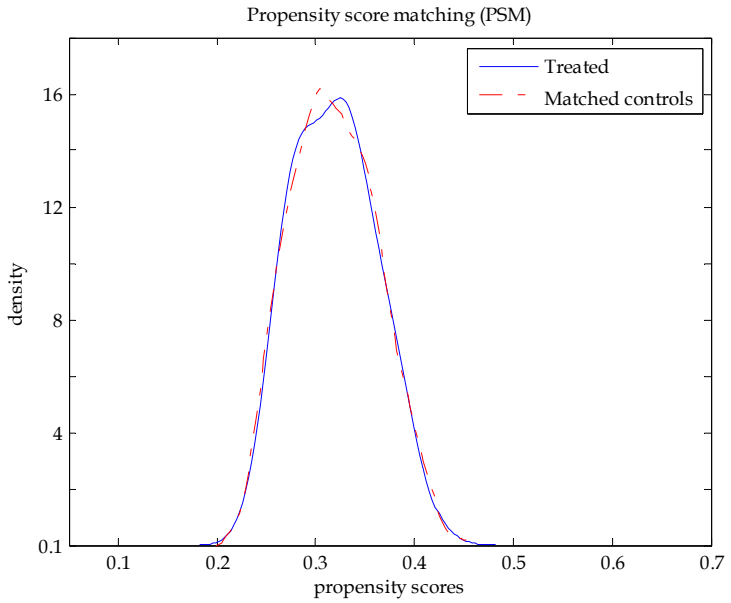


Figure 3

Propensity Scores for target (treated), control (matched non-treated) firms

This figure provides an illustration of the propensity score matching approach. The two densities plotted in the figure depict the predicted probability, i.e. propensity score, of being targeted by an HF for the acquired firms (blue), and rival firms (red).



Appendix A
Computation of Price Markups

Here we describe the estimation of Model 4 in Table A.1. We exclude organizational capital from our discussions for ease of notation. We assume Hicks neutral technological progress and the production process to be best described by a translog production function. Expressed in natural logarithms, the production function can be written as (Christensen et al., 1973):

$$y_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_{ll} l_{it}^2 + \beta_{kk} k_{it}^2 + \beta_{lk} l_{it} k_{it} + \omega_{it} + \eta_{it} \tag{A.1}$$

where l_{it}, k_{it} are log values of labor and physical capital of the firm and y_{it} is a value-added log output for firm i in period t. ω_{it} is the productivity and η_{it} is an error term not known by the firm or the econometrician. Productivity shocks anticipated by the firm are represented by ω_{it}, while η_{it} consists of measurement error and shocks in output the firm does not take into account when making its input decisions. [33] After obtaining estimates for the coefficients on labor and capital, the output elasticity of labor can be computed as:

$$\xi_i^L = \beta_l + 2\beta_{ll} l_{it} + \beta_{lk} k_{it} \tag{A.2}$$

While Olley and Pakes (1996) rely on an investment demand function to proxy for productivity, Levinsohn and Petrin (2003) advance the literature and introduce a material demand function. Since data on investment is readily available and often non-zero at the firm level but data on materials is not, we follow Olley and Pakes (1996) to estimate firm level productivities.[34] Our procedure consists of two steps. In a first step, we estimate the labor coefficients and separate the productivity term ω_{it} from the i.i.d. error term η_{it}. In Olley and Pakes (1996) ω_{it} is a state variable that affects firms' decision making where firms that observe a positive productivity shock in period

[33] A Cobb-Douglas production function is nested in the above representation and can be obtained by restricting the higher order term parameters β_{ll}; β_{kk} and β_{lk} to be equal to zero. Obviously, with a Cobb-Douglas production function, there exists no variation in the output elasticities across firms or over time. With a translog production function, while production function coefficients are the same for all producers, output elasticities differ across firms depending on their input use.

[34] Olley and Pakes (1996) provide the main IO approach to endogeneity problems. Assuming that investment is a monotonic function of productivity and capital, they replace productivity with the inverted function of capital and investment. Since the endogeneity problem is gone, they can estimate the labor coefficient and remove measurement errors in output. Assuming that productivity is first order Markov, a set of timing assumptions on when input decisions are made imply that observed variables or their lags are uncorrelated with the innovation in productivity. A GMM estimator from these moments identifies the capital coefficient.

t will invest more in physical capital, i_{it}, and and hire more labor, l_{it}, in that period. The solution to the firm's optimization problem results in the equations for i_{it}, $i_{it} = i(\omega_{it}, k_{it})$ where i is strictly increasing in ω. The inversion of this equation yields $\omega_{it} = h(i_{it}, k_{it})$. Consequently, we run the following regression:

$$y_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_{ll} l_{it}^2 + \beta_{kk} k_{it}^2 + \beta_{lk} l_{it} k_{it} + h_t(i_{it}, k_{it}) + \eta_{it} \tag{A.3}$$

In the estimation, we approximate the $h(.)$ function by including a second order polynomial in physical capital and investment in physical capital. Clearly, the capital coefficients are not separately identified from the $h_t(.)$ function, but we can retrieve an estimate $\hat{\phi}_{it}$ for the composite function containing the capital terms and productivity, $\phi_{it} \equiv \beta_k k_{it} + \beta_{kk} k_{it}^2 + h(i_{it}, k_{it})$.[35]

The second step serves to identify the capital coefficients. We follow the standard assumption that productivity follows an AR(1) process, i.e., $\omega_{it} = g(\omega_{it-1}) + \xi_{it}$, where ξ_{it} represents a shock to productivity in period t, unexpected at period *t-1* and that firms it takes one period to order, receive and install new capital. The timing assumption on capital gives us the moment conditions we are going to identify the capital coefficients with:

$$E\begin{bmatrix} \xi_{it} | k_{it} \\ | k_{it}^2 \end{bmatrix} = 0 \tag{A.4}$$

To sum up, our empirical strategy goes as follows: after obtaining an estimate $\hat{\phi}_{it}$ by executing a semi-parametric regression of output on inputs in the first stage, we take a candidate vector of input coefficients to compute $\hat{\omega}_{it} = \hat{\phi}_{it} - \hat{\beta}_k k_{it} + \hat{\beta}_{kk} k_{it}^2$. By non-parametrically regressing $\hat{\omega}_{it}$ on its lagged value we retrieve an estimate for the unexpected productivity shock ξ_{it} which is used to construct the sample analogue of the above moment conditions. Bringing this sample analogue as close as possible to zero, one finds consistent estimates for the capital coefficients of the production function.

We now turn to how we compute markups using our estimates and data on firm-level input expenditures and revenues. The key variables for estimating the firm level productivity in our benchmark case are the firm level value added, employment, and physical capital, organization

[35] Although the presence of log labor provides sufficient variation to identify the coefficient β_{lk} on the interaction term $l_{it} k_{it}$, we also experimented with a specification where we identify β_{lk} in the second stage and the main results did not change.

capital. The firm level data is obtained from Compustat and supplemented by industry level data from the NBER-CES Manufacturing Industry Database .Value added (y_{it}) is computed as Sales - Materials, deflated by the price deflator for the value of shipments for the matching industry from the NBER-CES Manufacturing Industry Database (PISHIP). Sales is net sales from Compustat (SALE). Materials is measured as Total expenses minus Labor expenses. Total expenses is approximated as [Sales - Operating Income Before Depreciation and Amortization (Compustat (OIBDP))]. Labor expenses is calculated by multiplying the number of employees from Compustat (EMP) by wages for the matching industry from the NBER-CES Database (PAY/EMP).The stock of labor (l_{it}) is measured by the number of employees from Compustat (EMP).

Capital stock (k_{it}) is given by gross Plant, Property & Equipment (PPEGT) from Compustat, deflated by the price deflator for investment for the matching industry from the NBER-CES Database (PIINV) following the methods of Hall (1990) and Brynjolfsson and Hitt (2003). Since investment is made at various times in the past, we need to calculate the average age of capital at every year for each company and apply the appropriate deflator (assuming that investment is made all at once in year [current year - age]). Average age of capital stock is calculated by dividing accumulated depreciation (Gross PPE - Net PPE, from Compustat (DPACT)) by current depreciation, from Compustat (DP). Age is further smoothed by taking a 3-year moving average. The resulting capital stock is lagged by one period to measure the available capital stock at the beginning of the period.

In our estimations we also include organizational capital an additional input in some of the models. Following Eisfeldt and Papanikolau (2009), we construct the organizational capital from the Sales, General, and Administrative Expenses from Compustat (XSGA) by using the perpetual inventory method. Sales, general and administrative expenses are considered as investment in organizational capital, deflated by the price deflator for investment for the matching industry from the NBER-CES Database (PIINV) and assumed to depreciate by 20% per year. Estimated production function parameters and markups are reported in Table A.2. be subject to greater agency problems as capital providers cannot observe, monitor, and assess spending on intangibles

Appendix B

Estimation of the Endogenous Switching Regression Model

Estimation strategies involve sequential estimation procedures or maximum likelihood. The sequential procedure involves first estimating (7) by a probit regression, yielding consistent estimates

of α. With this in hand, then the abnormal return regressions (8) are augmented with inverse Mills ratios (see Greene, 2003) as additional regressors; these terms adjust for the conditional mean of the error terms and allow consistent estimation by OLS. However, it is generally easier (and results in a more efficient estimator) to estimate the model using maximum likelihood. We follow the latter approach.

Econometrically, the hypothetical competitive performance in the second term in (11) is the predicted value from evaluating the attributes in the outcome equation for firms that are *not* targeted by HFA:

$$\begin{aligned} E\left[y_{2it} | \, Target_i^* > 0\right] &= E\left[\mathbf{w}_{2it-1}^{'}\beta_2 + \varepsilon_{2it} \, | \mathbf{z}_{it-1}^{'}\gamma + u_{it} > 0\right] \\ &= \mathbf{w}_{2it-1}^{'}\beta_2 + cov(\varepsilon_{2it}, u_{it}) \frac{\phi\left(\mathbf{z}_{it-1}^{'}\gamma\right)}{\Phi\left(\mathbf{z}_{it-1}^{'}\gamma\right)} \end{aligned}$$

Here, ϕ and Φ are the density and cumulative distribution functions of the normal distribution, respectively, and $\left[\phi\left(Z_i^{'}\alpha\right)/\Phi\left(Z_i^{'}\alpha\right)\right]$ is the inverse Mill's ratio. The model is identified by construction and estimated by maximizing the logarithmic likelihood function:

$$\ln \mathcal{L} = \sum_{i=1} \left\{ Target_{it} * \ln \Phi\left(\eta_{1it}\right) + \ln \phi\left(\frac{\varepsilon_{1it} \diagup \sigma_{11}}{\sigma_{11}}\right) + \left(1 - Target_{it}\right) * \ln \Phi\left(1 - \eta_{2it}\right) + \ln \phi\left(\frac{\varepsilon_{2it} \diagup \sigma_{21}}{\sigma_{21}}\right) \right\}$$

where $\eta_{kit} = \left(\mathbf{z}_{it}^{'}\gamma + \frac{\sigma_{ku}}{\sigma_{kk}}\varepsilon_{kit}\right) \diagup \sqrt{1 - \frac{\sigma_{ku}^2}{\sigma_{kk}}}$ $k = 1, 2$; $\rho_1 = \frac{\sigma_{1u}^2}{\sigma_u \sigma_1}$ is the correlation coefficient between ε_1 and u, and $\rho_2 = \frac{\sigma_{2u}^2}{\sigma_u \sigma_2}$ is the correlation coefficient between ε_2 and u.[36] If β_1 is equal to β_2, and σ_{1u} is equal to σ_{2u} then ε_1 is equal to ε_2 and the likelihood function reduces to a standard normal density.

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Table A.1 Estimated Production Parameters and Markups

This table presents the estimated production function parameters and markups where estimation relies on a method developed by Olley and Pakes (1996). In Model 1 the production function is assumed to have a Cobb-Douglass form between labor and physical capital. In Model 2 (5) with organization capital, the production function is assumed to have a Cobb-Douglass (Translog) form between labor, physical capital and organization capital and without endogenous productivity. In Models 4 and 3 production function is Translog with and without organizational capital, respectively and TFP is assumed to follow an AR(1) process. Autocorrelation of TFP is also reported. Markups are estimated jointly with the production functions as described in the main text. Standard errors are presented in parentheses.

	Model 1: Cobb-Douglas		Model 2: Cobb-Douglas		Model 3: Translog		Model 4: Translog		Model 5: Translog	
	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E	Estimate	S.E
Labor	0.632	(0.003)	0.724	(0.003)	0.805	(0.001)	0.687	(0.002)	0.701	(0.004)
Capital	0.108	(0.007)	0.115	(0.006)	0.160	(0.003)	0.136	(0.005)	0.129	(0.002)
Organizational Capital			0.138	(0.001)			0.122	(0.002)	0.144	(0.008)
Autocorrelation	0.787	(0.001)			0.855	(0.001)	0.700	(0.007)		
Markup	1.425	(0.001)	1.489	(0.005)	1.650	(0.001)	1.639	(0.002)	1.553	(0.006)
Endogenous productivity	yes		no		yes		yes		no	
Organizational capital	no		yes		no		yes		yes	