Internet Appendix for "Financial Strength and Product Market Behavior: The Real Effect of Corporate Cash Holdings"*

This appendix provides descriptive statistics for the variables used in the analysis. In addition, it provides further information on the quasi-natural experiment used in Section III.C and presents a detailed analysis supporting the validity of tariff reductions to identify the direction of the causality between cash and product market performance. Finally, it presents several additional tests that show that cash holdings and their effect on market share growth are persistent through time.

A. Descriptive Statistics

Table IA.I presents summary statistics for the main variables of interest. Overall, they are comparable to those found in related studies, such as Campello (2006), Acharya, Almeida, and Campello (2007) or Bates, Kahle, and Stulz (2009).

B. Quasi-natural Experiment: Variations of Import Tariffs

B.1. Discussion of the Tariff Data

The product-level U.S. import data used in the analysis are compiled by Feenstra (1996) and Feenstra, Romalis, and Schott (2002). This dataset spans the period 1972 to 2001. The matching with my sample of *Compustat* firms leaves 67 industries with available information on imports, collected duties, exports, and domestic production. For each industry-year, I define the *ad valorem* tariff rate as the duties collected by U.S. Customs divided by the Free-On-Board value of imports.

To measure reductions in import tariffs, I compute the annual change in *ad valorem* tariff rates. Since the coding of imports changed in 1989, I do not use the yearly changes between 1988 and 1989, but set them equal to zero. Then, to identify *sizeable* changes in tariff rates, I characterize tariff reductions in terms of the deviations in the yearly tariff changes from their median level. More precisely, I specifically define that a tariff "cut" occurs in an industry-year when a negative change in tariff rate is 2, 2.5, or 3 times larger than its median value. Moreover, to make sure that large reductions in tariffs truly reflect non-transitory changes in trade policy, I exclude tariff cuts that are followed by equivalently large increases in tariffs over the two subsequent years. Figure IA.1 plots the annual tariff rate around the identified tariff cuts for the third (tightest) definition of tariff reduction. We observe a substantial reduction in tariff rate, indicating that three definitions of large tariff reductions consistently pin down sizeable changes in trade policy. Note that I obtain similar patterns for the two other definitions of tariff cut. Figure IA.2 displays the distribution of tariff reductions over time. Noticeably, tariff reductions are not clustered in a specific time period but occur in different industries at different times.

The key advantage of using tariff data is that they provide sufficient time-series and cross-industry variation to identify the competitive effect of cash. Moreover, they are derived directly from product-level trade data collected at the border. Nevertheless, one caveat should be noted. The changes in tariffs that I use are *effective* changes for a given industry. Hence,

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changes in the composition of products or importers within industries can induce variation in effective tariffs even if the statutory tariffs remain constant. Since I am interested in changes in competitive pressures induced by trade openness, this should not have any material effect on the analysis.

B.2. Validity of the Quasi-natural Experiment

To be considered a valid quasi-natural experiment, reductions in import tariffs have to fulfill three requirements. First, they should bring real-side changes in the competitive nature of the product market. Second, they should be exogenous to industry performance and financing. Third, they should be partly unanticipated. Given that the literature on international trade is relatively silent on the potential links between trade policy and industry-level financing, I use a combination of descriptive figures and reduced-form statistical evidence to support the validity of this quasi-natural experiment.

The crux for using tariff reductions rests in the idea that lower tariffs make it less costly for foreign rivals to compete in domestic markets, thereby putting competitive pressure on U.S. firms. To verify this conjecture, I first examine whether reductions in import tariffs are associated with changes in the level of import penetration. Following Bertrand (2004) and Irvine and Pontiff (2009), I define *Import Penetration* as the total value of imports divided by imports plus domestic production. This variable can be interpreted as the aggregate market share of foreign competitors. Figure IA.1 (right axis) displays the evolution of the average import penetration in the years surrounding tariff reductions. Strikingly, we observe a substantial increase in import penetration after tariffs have been cut. The economic magnitude is large, with import penetration increasing from 12% the year before the cut to above 15% one year after the cut. This event-time pattern supports the intuition that reductions in import tariffs effectively breed competitive pressure in domestic firms and are in line with evidence from the trade literature (e.g. Bernard, Jensen and Schott (2006), Lee and Swagel (1997) or Trefler (1993)).

Second, to be a valid experiment, the source of variation that shifts the competitive environment has to be exogenous with respect to firms' cash policy and performance. Arguably, one might contend that tariff levels are driven by political factors associated with financial outcomes. For instance, trade protection may be granted to industries with particular financing and/or performance profiles. Table IA.II reports various validity checks. First, Panel A compares the averages of four financial variables between firms in industries that will experience a tariff cut one year ahead and firms in industries that never experience a tariff reduction over the sample period. Notably, the panel suggests that industries experiencing tariff reductions are generally comparable with industries that are not affected by tariff changes. Indeed, we do not observe any systematic difference in their average levels of cash, debt, or performance. To provide further support for the exogeneity of tariff reductions, I estimate various specifications linking tariff reductions to industries' (median) past financing conditions, performance as well as macroeconomic factors. The results are presented in Panel B. Columns 1 to 3 report logistic estimations where the dependent variables are the three definitions of tariff reduction (*tariff cut # 1* to *tariff cut # 3*). Although the coefficients generally have the expected sign, past financing choices, and performance do not seem to correlate with tariff reductions. Column 4 further reports results from an OLS regression where the dependent variable is the annual change in industry-level tariff rates. Again, we note no systematic ability of industry variables to predict trade policy. Across all specifications, only the annual changes in GDP and the number of firms within the industry seem to predict future tariff changes. Note that I obtain equivalent results if I use industry

averages instead of medians. By and large, these results mitigate potential concerns about the endogeneity of tariff reductions to the major variables used in the analysis.

Finally, the competitive changes triggered by tariff reductions should allow for unanticipated effects. More precisely, reductions in import tariffs should make it difficult for firms to fully endogenize the consequences in their ex-ante financial choices. Figure IA.3 plots the evolution of the average cash levels, debt ratios, and market value in the years surrounding tariff reductions for the third (tightest) definition of tariff reduction. Interestingly, we observe no systematic change in cash and debt levels prior to the tariff cuts. However, firms seem to significantly alter their financial choices in the aftermath of tariff changes. These event-time patterns corroborate the results of Table IV (columns 4 to 6) in the main text, which reveal no anticipation behavior prior to tariff reductions. Interestingly, we also note a sharp decline in the average firm value during the year that follows tariff reductions. This value shortfall suggests that, over the sample period, large tariff reductions were not fully anticipated by market participants. In light of these results, there is little reason to believe that cash holdings were chosen optimally beforehand to deal with the consequences of the increased product market competition.

C. Persistence of Cash Holdings and their Competitive Component

One important question that arises from the analysis is whether cash holdings and their competitive effect on market share growth are persistent over time. To shed light on this issue, I conduct several additional tests. Specifically, to examine the persistence of firms' financial strength, Table IA.III presents the empirical transition probabilities for relative-to-rivals (z-scored) cash as well as for cash-to-asset ratios. For both variables, I first rank firms into annual quartiles over the sample period. I then use the quartile ranks to estimate transition probabilities as the empirical probability of a firm moving from one quartile during year t to another quartile in year t+1, t+2, or t+3. For both variables, this table suggests a high level of persistence. Consider, for instance, firms in the fourth quartile of z-scored cash, that is, entries in the last rows of the Panel A. These are cash-rich firms. The empirical probabilities that a cash-rich firm in year t will remain a cash-rich firm (fourth quartile) in years t+1, t+2, or t+3 are respectively, 0.645, 0.563, and 0.421. Notably, we observe similar patterns for cash-poor firms.

Next, Table IA.IV reports the results of various specifications that gauge whether the effect of cash on market share growth persists over time. In the first three columns, I introduce additional lags of (instrumented) z-scored cash in the baseline specification (1) of Table I to assess the intertemporal impact of cash on market share growth. The coefficients on lagged z-scored cash (t-3, t-4, and t-5) measure the lagged performance-cash sensitivities, which effectively indicate how an additional dollar of cash (relative-to-rivals) today impacts, ceteris paribus, market share growth two, three, and four years later. Interestingly, even though the competitive effect of cash tends to decrease over time, we observe a positive and significant coefficient on $zCash_{t-5}$. Alternatively, in columns 4 to 6, I estimate the effect of cash on multiple-years market share growth. In these regressions, the dependent variables are the growth in market shares obtained over the period t-1 to t+1, t-1 to t+2, and t-1 to t+3. For the three horizons, we notice positive and significant coefficients on cash, confirming that having more cash than rivals allows firms to expand market share over a longer horizon. On the whole, these additional results reveal an important degree of persistence in both cash holdings and their impact on product market performance, and hence provide additional support for my interpretation.

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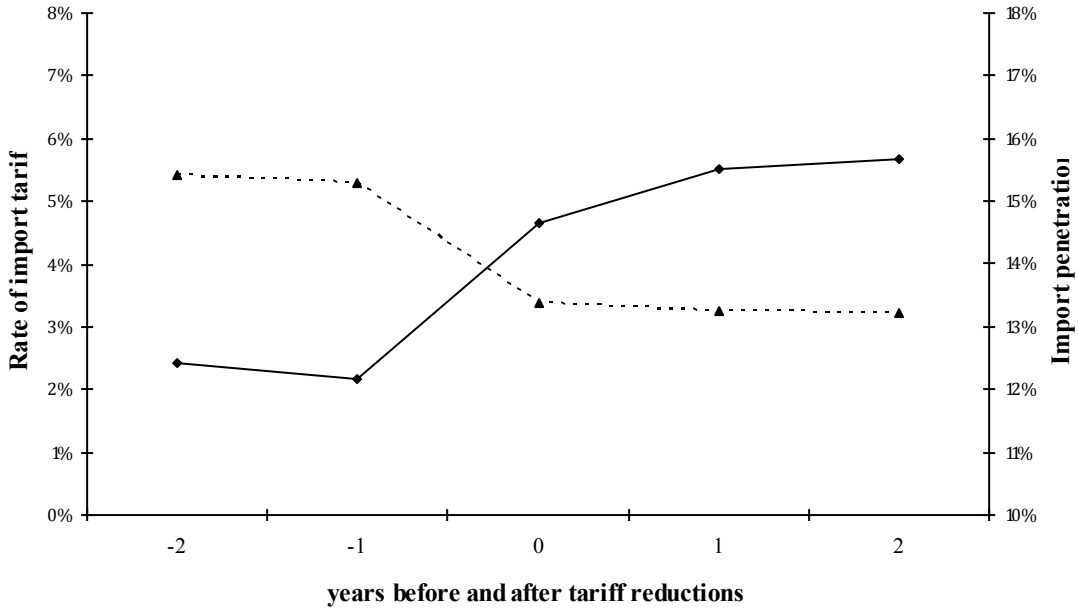
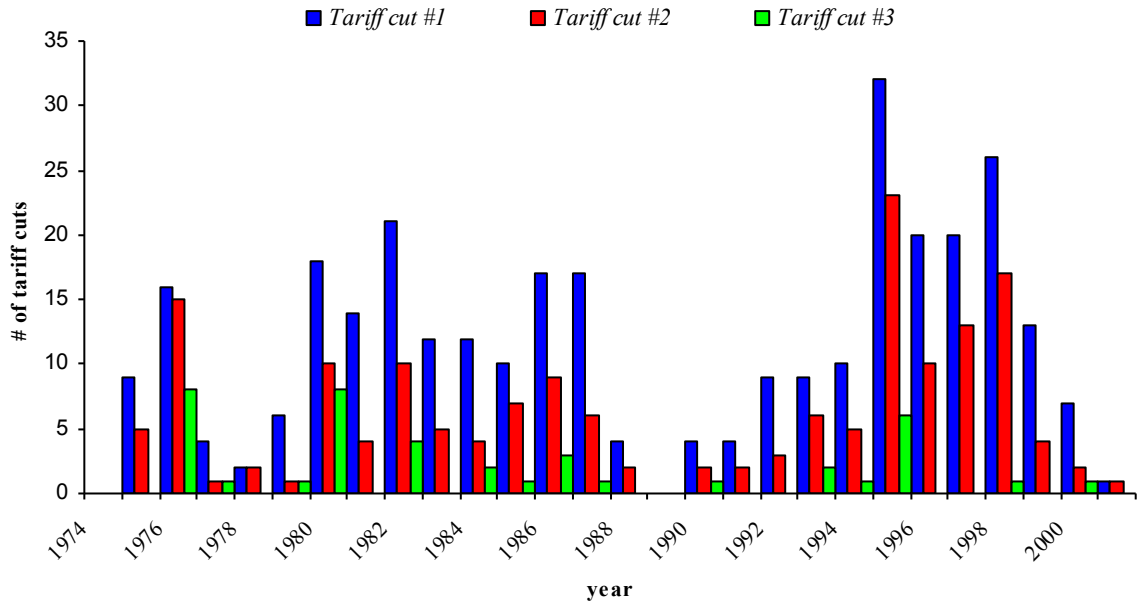
Figure IA.1. Evolution of tariff rate and import penetration around tariff reductions



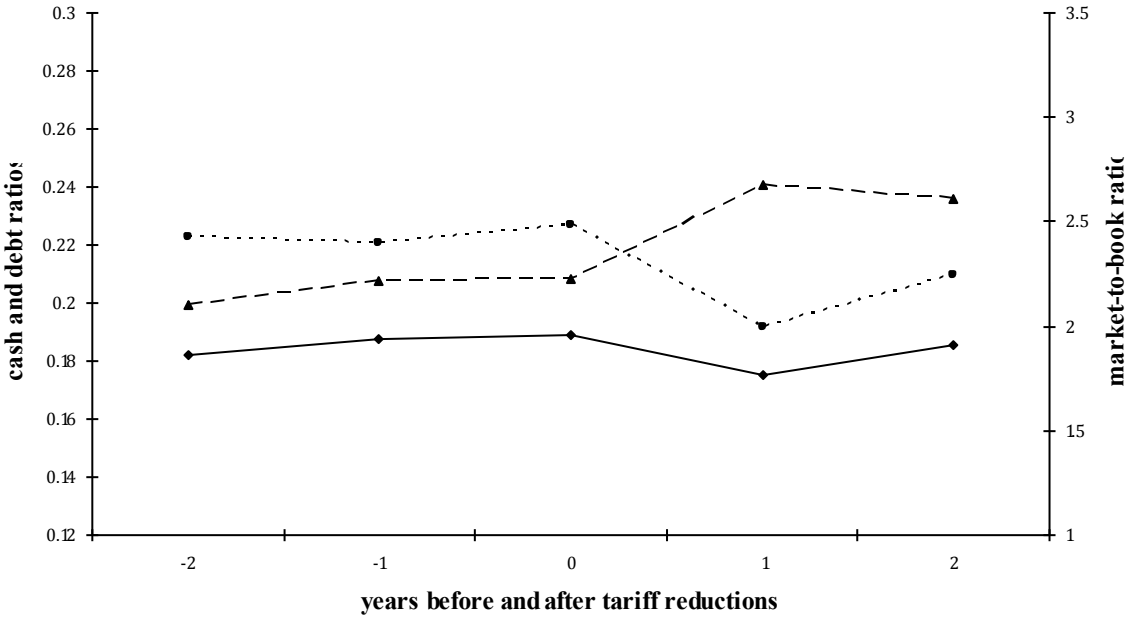
This figure displays the average tariff rates and import penetration surrounding years of tariff reductions. Tariff reductions are defined when industry-year change in tariff rate (ΔT) are negative and 3 times larger than its median value. The dashed line represent tariff rate while the solid line represents import penetration. The sample period is 1973 through 2001.

Figure IA.2. Distribution of tariff reductions over time



This figure displays the repartition of tariff reductions over time. Tariff reductions are defined using three different cut-offs. Specifically a tariff cut occurs when industry-year change in tariff rate (ΔT) are negative and 2 (blue bars), 2.5 (red bar) and respectively 3 (green bar) times larger than its median value. The sample period is 1973 through 2001.

Figure IA.3. Evolution of Firm Valuation around Tariff Reductions



This figure displays the average cash-to-asset ratio (dashed line), debt-to-asset ratio (solid line) and book-to-market ratio (dotted line) surrounding years of tariff reductions. Tariff reductions are defined when industry-year change in tariff rate (ΔT) are negative and 3 times larger than its median value. The sample period is 1973 through 2001.

Table IA.I
Summary Statistics

This appendix reports summary statistics for the main variables used in the empirical analysis. The final sample has statistical properties that are very similar to those reported in comparable studies that use *Compustat* (see, for example, Campello (2006)). The sample period is 1973 through 2006. Included firms are from industries selected at the four-digit SIC level following Clarke (1989).

	#Obs	Mean	Median	Std.Dev	Pct. 25	Pct. 75
Cash	54346	0.186	0.092	0.218	0.030	0.265
Sales Growth	47424	0.136	0.098	0.331	-0.026	0.245
Assets ($Million)	54347	687	59	2289	16	280
Investment	53845	0.055	0.042	0.049	0.021	0.075
Leverage	54809	0.139	0.100	0.146	0.007	0.226

Table IA.II
Differences between Industries that Experience and Industries that Do Not experience a Reduction in Tariffs

This table presents univariate and multivariate comparisons between firms in industries that experience a reduction in import tariffs and firms in industries that do not. Tariff reductions are defined using three different cut-offs. Specifically, a tariff cut occurs when an industry-year change in tariff rate (ΔT) is negative and 2 (*tariff cut#1*), 2.5 (*tariff cut#2*), and 3 (*tariff cut#3*) times larger than its median value. The sample period is 1973 through 2001. Panel A reports the means and the number of firm-year observations in industries that will experience a tariff reduction one year ahead and those in industries that do not. Panel B reports results from logistic and OLS regressions that explain variation in trade policy as a function of lagged industry (median) variables and lagged macroeconomic variables. In the logistic estimations, the dependent variable is a dummy that equals one if the industry experiences a tariff reduction and zero otherwise. In the OLS regression the dependent variable is the annual variation in import tariff. I report *t*-statistics in brackets. ** and * denote statistical significance at the 1% and 5% level, respectively.

Panel A : Desciptive statistics

Variables	*tariff cut#1*	*tariff cut#2*	*tariff cut#3*	**Non-Affected**
Cash	0.183	0.190	0.199	0.196
	5697	*3321*	*751*	*21608*
Leverage	0.193	0.191	0.186	0.198
	5763	*3352*	*758*	*21884*
Market-to-Book	2.056	2.056	2.011	2.105
	5610	*3259*	*724*	*21025*
ROA	0.050	0.048	0.037*	0.053
	5709	3318	749	21618

Panel B : Multivariate analysis

	Logistic regressions			**OLS**
Variables	*tariff cut#1*	*tariff cut#2*	*tariff cut#3*	*ΔTariff*
$Ind.Cash_{t-1}$	-3.978	-3.059	-3.432	0.216
	[1.62]	[1.13]	[0.67]	[0.38]
$Ind.\ Leverage_{t-1}$	0.418	0.936	0.664	0.238
	[0.25]	[0.45]	[0.45]	[0.59]
$Ind.\ Market\text{-}to\text{-}Book_{t-1}$	0.571	0.27	0.356	-0.014
	[1.10]	[0.82]	[1.06]	[0.19]
$Ind.ROA_{t-1}$	0.217	0.578	0.962	-0.508
	[1.09]	[1.15]	[1.14]	[0.69]
$Ind.\ Size_{t-1}$	-0.045	-0.023	-0.398	0.025
	[1.08]	[1.12]	[1.11]	[0.65]
$Ind.\ \#firms_{t-1}$	0.016*	0.023*	0.019**	-0.002
	[1.65]	[1.92]	[1.98]	[0.69]
ΔGDP_{t-1}	5.216	3.385	5.528**	-2.119 *
	[1.20]	[1.07]	[2.87]	[1.69]
$\Delta IndPro_{t-1}$	-1.643	-0.974	-3.525	0.011
	[1.71]	[1.33]	[1.49]	[1.02]
Log Likelihood [R^2]	-420.04	-286.78	-86.82	[0.06]
#Obs	1001	931	600	1072

Table IA.III
Empirical Cash Holdings Transition Probabilities

This table displays the empirical transition probabilities for z-scored relative-to-rivals cash-to-assets (*zCash*) as well as for cash-to-assets (*Cash*). The transition probability for cell (*i,j*) is the probability of a firm moving from *zCash* (*Cash*) quartile *i* during year *t* to *zCash* (*Cash*) quartile *j* in year *t*+1 (or *t*+2 and *t*+3). The sample period is 1973 through 2006. The probabilities do not sum to one because of rounding errors. Numbers in brackets are the actual number of firms in each cell.

Panel I. Relative-to-Rival Cash (*zCash*)

t/*t*+1	1st quar.	2nd quar.	3rd quar.	4th quar.
1st quar.	**0.707**	**0.203**	**0.056**	**0.033**
	(7821)	(2247)	(620)	(367)
2nd quar.	**0.206**	**0.475**	**0.227**	**0.09**
	(2288)	(5254)	(2515)	(999)
3rd quar.	**0.055**	**0.227**	**0.485**	**0.231**
	(618)	(2514)	(5364)	(2559)
4th quar.	**0.029**	**0.094**	**0.231**	**0.645**
	(328)	(1041)	(2556)	(7131)

t/*t*+2	1st quar.	2nd quar.	3rd quar.	4th quar.
1st quar.	**0.608**	**0.24**	**0.091**	**0.059**
	(6721)	(2661)	(1011)	(662)
2nd quar.	**0.239**	**0.386**	**0.251**	**0.122**
	(2651)	(4272)	(2783)	(1350)
3rd quar.	**0.092**	**0.242**	**0.41**	**0.254**
	(1022)	(2675)	(4540)	(2818)
4th quar.	**0.059**	**0.131**	**0.246**	**0.563**
	(661)	(1448)	(2721)	(6226)

t/*t*+3	1st quar.	2nd quar.	3rd quar.	4th quar.
1st quar.	**0.541**	**0.24**	**0.11**	**0.154**
	(5333)	(2372)	(1084)	(2266)
2nd quar.	**0.258**	**0.349**	**0.248**	**0.178**
	(2549)	(3442)	(2443)	(2662)
3rd quar.	**0.12**	**0.252**	**0.384**	**0.245**
	(1183)	(2488)	(3783)	(3601)
4th quar.	**0.079**	**0.156**	**0.257**	**0.421**
	(781)	(1545)	(2536)	(6194)

Panel II. Cash-to-Asset (*Cash*)

t/*t*+1	1st quar.	2nd quar.	3rd quar.	4th quar.
1st quar.	**0.786**	**0.167**	**0.03**	**0.016**
	(8689)	(7849)	(332)	(185)
2nd quar.	**0.169**	**0.556**	**0.206**	**0.068**
	(1870)	(6147)	(2280)	(759)
3rd quar.	**0.031**	**0.212**	**0.524**	**0.231**
	(344)	(2345)	(5802)	(2564)
4th quar.	**0.013**	**0.0647**	**0.238**	**0.682**
	(152)	(715)	(2641)	(7548)

t/*t*+2	1st quar.	2nd quar.	3rd quar.	4th quar.
1st quar.	**0.717**	**0.198**	**0.053**	**0.03**
	(7929)	(2193)	(596)	(337)
2nd quar.	**0.196**	**0.464**	**0.231**	**0.107**
	(2173)	(5137)	(2554)	(1192)
3rd quar.	**0.056**	**0.232**	**0.448**	**0.261**
	(628)	(2571)	(4963)	(2893)
4th quar.	**0.029**	**0.104**	**0.266**	**0.6**
	(325)	(1155)	(2942)	(6634)

t/*t*+3	1st quar.	2nd quar.	3rd quar.	4th quar.
1st quar.	**0.655**	**0.205**	**0.068**	**0.129**
	(6455)	(2027)	(670)	(1903)
2nd quar.	**0.229**	**0.411**	**0.24**	**0.161**
	(2257)	(4053)	(2372)	(2374)
3rd quar.	**0.073**	**0.255**	**0.409**	**0.257**
	(726)	(2517)	(4027)	(3785)
4th quar.	**0.041**	**0.126**	**0.282**	**0.45**
	(408)	(1250)	(2777)	(6621)

Table IA.IV
Persistence of the Cash-Performance Sensitivities

This table presents the results of IV regressions examining the effect of relative-to-rivals cash holdings on market share growth (specification (1)). In columns 1 to 3 the dependent variable is ΔMS_t, the annual market share growth given by industry-adjusted sales growth at time t [$(Sales_t - Sales_{t-1})/Sales_{t-1}$]. In columns 4 to 6 the dependent variables are multiple years market share growth given by industry-adjusted multiple-years sales growth at time t+1, t+2, and t+3 [$(Sales_{t+k} - Sales_{t-1})/Sales_{t-1}$ for k=1,2, and 3]. *zCash* is the z-scored ratio of cash and marketable securities divided by total assets. *Size* is the natural logarithm of assets. *Leverage* is long-term debt over assets. All control variables are adjusted for their four-digit SIC industry-year means. The sample period is 1973 through 2006. The estimations correct the error structure for heteroskedasticity and within-firm error clustering. I report *t*-statistics in brackets. ** and * denote statistical significance at the 1% and 5% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	ΔMS_t	ΔMS_t	ΔMS_t	$\Delta MS_{t,t+1}$	$\Delta MS_{t,t+2}$	$\Delta MS_{t,t+3}$
$zCash_{t-2}$	0.027**	0.026**	0.026**	0.069**	0.097**	0.118**
	[10.41]	[9.89]	[9.32]	[13.71]	[12.33]	[10.77]
$zCash_{t-3}$	0.011**	0.012**	0.010**			
	[4.75]	[3.86]	[3.37]			
$zCash_{t-4}$		0.008*	0.006*			
		[2.33]	[2.12]			
$zCash_{t-5}$			0.005*			
			[1.98]			
$Size_{t-1}$	0.043**	0.043**	0.043**	0.019**	0.017**	0.012**
	[16.54]	[15.94]	[15.17]	[3.38]	[4.41]	[4.72]
$Leverage_{t-1}$	0.008*	0.008**	0.009**	-0.012*	-0.026**	-0.032**
	[2.46]	[2.91]	[2.43]	[2.24]	[3.07]	[2.72]
$Leverage_{t-2}$	-0.001**	-0.006**	-0.009**	-0.014**	-0.020**	-0.030*
	[3.42]	[3.66]	[3.04]	[3.09]	[3.78]	[2.54]
$\Delta MarketShares_{t-1}$	0.008	0.008	0.005	-0.095**	-0.166**	-0.195**
	[1.60]	[1.50]	[1.23]	[8.08]	[9.05]	[7.59]
$\Delta MarketShares_{t-2}$	-0.073**	-0.076**	-0.083**	-0.124**	-0.149**	-0.191**
	[14.15]	[13.79]	[14.11]	[10.98]	[8.85]	[7.70]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
# Obs	34774	31558	28447	33687	31089	27556
R^2	0.24	0.24	0.25	0.32	0.41	0.45