

# **Intra-Industry Effects of IPOs on Stock Repurchase Decisions of Rival Firms**

**Thanh T. Nguyen**  
**University of Wisconsin-Eau Claire**

**Ninon K. Sutton**  
**University of South Florida**

**Dung (June) Pham**  
**Shippensburg University of Pennsylvania**

*Previous studies suggest that the market perceives IPOs as bad news to existing firms in the same industry. However, investors tend to be overly optimistic about IPO prospects, especially during hot IPO markets. Thus, the negative industry rival reaction could be the result of investors' over-optimism about the IPOs' prospects and underestimation of the competitive positions of industry rivals. Our findings show that rival firms use repurchases to correct for the market's overreaction to the IPO threat. These IPO-induced repurchases are stronger when the rival firms are in a concentrated industry and experienced poor stock performance in the previous year.*

## **INTRODUCTION**

Prior research has observed that IPOs may pose a competitive threat for rival firms in the same industry. In particular, Hsu, Reed, and Rocholl (2010) find that rival firms experience negative stock price reactions to completed IPOs in their industries, equivalent to an average loss of -\$3.27 million for an incumbent firm around the IPO event. New IPOs prompt investors to reevaluate the competitive conditions in the industry and to recognize the possible competitive advantages possessed by the newly-public firm. As Hsu et al. note, these advantages for newly-public firms may include the improved access to financing, their recent certification by underwriters, and their valuable knowledge capital, in comparison with incumbent firms. In line with this logic, empirical evidence by Slovin, Sushka, and Ferraro (1995) shows that rival firms suffer a negative CAR of -0.93% during the two day window of an IPO announcement in the same industry. Akhabe, Borde, and Whyte (2003) also find evidence of the negative impact of IPOs on industry rivals for large IPOs in competitive industries.<sup>1</sup> In further support of the competitive effects of IPOs, Hsu et al. find that the operating performance of industry rivals declines following a large IPO in the industry.

While the market may view IPO firms as strong new competitors in the industry, ample evidence suggests that investors tend to be overly enthusiastic about the growth prospects of newly-public firms, especially during hot IPOs markets.<sup>2</sup> Specifically, previous studies find evidence consistent with the misvaluation hypothesis. Ritter (1991) suggests two possible explanations for IPO misvaluation, and the subsequent long-run underperformance of IPOs: Investors tend to be overly optimistic about the future

expected earnings of young growth firms during IPO periods, and firms capitalize on these “windows of opportunity”. Similarly, Loughran and Ritter (1995) argue that investors might give high valuations to IPOs at the time of going public because they “believe that they have identified the next Microsoft.” Ritter and Welch (2002) also find empirical evidence that IPOs are overpriced on the first day and have poor stock performance in the long-run. Over three years, the average IPO underperformed the market by 23.4 percent and underperformed size and book-to-market matched firms by 5.1 percent. Purnanandam and Swaminathan (2004) provide evidence that IPOs were about 14% to 50% overvalued at the offer price compared to their industry peers. They argue that the overvaluation is caused by IPO investors paying too much attention to optimistic growth forecasts and too little attention to current profitability in their assessment of IPO value.

Given the often overly optimistic market sentiment towards IPOs and the negative market inferences regarding rival firms’ diminished competitive positions, rival firm managers may believe the damage to their stock price is unwarranted. These rival firms may choose to use repurchases as a means to signal firm-quality and to correct the market’s overreaction to the bad news (i.e., the competitive threat caused by the IPO), especially during hot IPO markets. In line with this logic, Peyer and Vermaelen (2009) argue that stock repurchases may be the firm’s response to investors’ overreaction to analysts’ downgrade recommendations during the 6 months prior to the repurchase announcement. Dudley and Manakyan (2011) further provide evidence that firms use stock repurchases in order to support their stock prices due to widespread selling by mutual funds experiencing large capital outflows. Vermaelen (1981) concludes that repurchases make the market more efficient because firms can correct mispricing of their securities. To provide further evidence on the motivation behind the repurchase decision, we examine repurchases as a possible reaction to the competitive effects of IPO activity within the industry.

Our results show that rival firms increase their repurchases in the presence of the incoming competitive threat from IPOs. In particular, tobit models show that a rival firm increases its share repurchase volume by around 15%, on average, when faced by the competitive effects of IPOs in the same industry. Moreover, if the firm has experienced poor stock performance in the previous year and is in a concentrated industry, its repurchase volume increases by about 29.2%. The results of probit models show that the repurchase probability of a rival firm increases by about 11.1%, on average, during IPO waves in the industry. The probability of repurchase increases to about 37.1% for poorly performing rival firms in high concentration industries.

Overall, this paper contributes to several different streams of literature. First, the results highlight a new motivation behind the repurchase decision. In particular, the evidence shows that firms strategically use repurchases to support their stock prices in the presence of the perceived competitive threat caused by large number of IPOs in the industry. The effects are stronger for rival firms with poor stock performance in the previous year and those in concentrated industries. The effects are independent of economic conditions and not driven by the internet bubble years. Second, the findings highlight a previously unrecognized link between two different corporate events, IPOs and repurchases. Furthermore, this study contributes to the literature examining the intra-industry effects of corporate decisions by not only examining the stock price impact on rivals, but also the impact on rival firm decisions.

The remainder of this paper is structured as follows. Section 2 is a brief literature review on motivations for stock repurchases. Section 3 presents descriptions of sample data and variables. Section 4 includes summary statistics and univariate tests. Section 5 presents results of tobit and probit regressions and robustness checks. A brief conclusion follows.

## **MOTIVATIONS FOR STOCK REPURCHASES**

Why do firms buy back their stock? The literature has presented a long list of motivations to answer the question, and the reasons are not mutually exclusive. Given the many dimensions of the repurchase decision, this list is likely not complete. Nevertheless, the following discussion reviews the most common reasons for stock repurchases.

### **Agency cost of Free Cash Flow Hypothesis**

Because of the separation between ownership and control in large corporations, managers of firms which have unnecessarily high free cash flows might pursue sub-optimal projects at the expense of shareholders. The market will impose an agency cost on these firms. Managers of these firms might mitigate the agency cost problem by paying out excess cash through stock repurchase or dividend (Jensen, 1986). Stephen and Weisbach (1998) find that stock repurchase is positively related to both expected and unexpected cash flows, and Dittmar (2000) also finds a connection between repurchases and excess cash. Grullon and Michaely (2004) show that the market reaction to repurchase announcements is more positive for those firms that are more likely to overinvest, consistent with the prediction of the free cash flow hypothesis.

### **Cash Flow Signaling Hypothesis**

If managers have positive information about their firms' future earnings that is not available to the public, the stock prices of their firms might be undervalued. These managers may send a credible signal of their optimism about the firms' earnings prospects by paying out through a dividend or repurchase program (e.g., Vermaelen, 1981; Miller and Rock, 1985 among others.) Bartov (1991) finds there are positive unexpected annual earnings in the repurchase announcement year, and analysts upwardly revise the earnings forecast at the repurchase announcement dates. On the contrary, Grullon and Michaely (2004) use a much larger sample and find no evidence that analysts revise their earnings forecasts upward around the repurchase announcements and only a weak evidence of earnings improvements during the announcement year. In comparing the post-event operating performance of repurchasing firms with that of non-repurchasing firms with similar pre-event characteristics, Lie (2005) finds that repurchasing firms actually improve post-event operating performance relative to their control firms with similar pre-event characteristics. He further concludes that the improvement is restricted to firms which actually repurchase in the announcement quarters.

### **Undervaluation Signaling (or Market Timing) Hypothesis**

The undervaluation motive is so far the most commonly cited motivation for the repurchase decision. This hypothesis argues that managers might signal their disagreement with how the market prices their firms based on existing public information. In line with the use of repurchases to signal undervaluation, Ikenberry, Lakonishok, and Vermaelen (1995) find excess returns of 12.14% over the four year post-repurchase period for their entire sample of 1,208 repurchase announcements. More importantly, the results show that "value" firms, which are more likely to be undervalued, experience significant abnormal returns of 45% over the four year post-repurchase period, compared to an insignificant -4.31% for "growth" firms. Other studies also find evidence of undervaluation as a common motivation for repurchase (e.g., Stephens and Weisbach, 1998; Chan, Ikenberry and Lee, 2004)

### **Mimicking Hypothesis**

Massa et al. (2007) argue that when a firm repurchases its shares, this announcement will send a positive signal about itself and a negative signal about its rival firms in the same industry. Therefore, the rival firms will also execute repurchase programs to mitigate this negative signal.

### **Liquidity Provision Hypothesis**

Hong, Wang, and Yu (2008) argue that firms can act as "buyers of last resort" when their share prices drop far below fundamental value. They find that firms with fewer financial constraints execute repurchase programs to support their stock prices during hard times. This increases the liquidity for the stocks and decreases stock volatility over time. Dudley and Manakyan (2011) lend some support for this argument by documenting that a firm will repurchase its stock when the stock price is under selling pressures caused by financially constrained mutual funds.

### **Overreaction to Bad News Hypothesis**

More recently, Peyer and Vermaelen (2009) uncover a new possible motivation for the stock repurchase decision. They find evidence that firms use stock repurchases as responses to market overreaction to bad news prior to the repurchase i.e., significant analyst downgrades combined with overly pessimistic forecasts of long-term earnings.<sup>3</sup>

In a similar vein, we propose a new, related motivation for repurchases. Specifically, we examine whether firms repurchase their stock as a reaction to the competitive threat posed by strong IPO activity within the industry.

### **DATA AND VARIABLE DESCRIPTIONS**

The data used in this paper comes from the following sources. Repurchase data and other accounting control variables are from Compustat's annual data over the period from 1988 to 2011.<sup>4</sup> IPO-related data are obtained from the Securities Data Corporation (SDC) New Issues Database. We start with the full set of firms in Compustat. Following the repurchase literature, we then exclude utilities, financial firms, ADRs, and firms in the financial crash year of 1987.

We also exclude tender-offers and privately negotiated repurchases because they are different from open-market repurchases in terms of flexibility and costs. We require that data be available for repurchase variables and control variables. Data for computing stock returns are from the Center for Research in Security Prices (CRSP) monthly returns. Our final sample includes 35,445 firm-year observations of 5,678 firms and spans from 1988 to 2011.

Following Dittmar and Dittmar (2008) and Yook (2010), dollar repurchases for each year are measured as the yearly repurchase of common and preferred stock (*prstk*) less any decrease in preferred stock. Preferred stocks are measured as, in order of preference, redemption value (*pstkr*), liquidating value (*pstkl*), or carrying value (*pstk*). According to Banyl, Dyl, and Kahle (2008), this way of measuring actual repurchases is the most accurate method, especially when many repurchases are used to mitigate the dilutive effects of employee stock options. In the tobit models, we use Percent repurchases as the dependent variable, which is equal to dollar repurchases at year *t* divided by market value of stock at the end of year *t-1*. In the probit models, we use a *Rp\_dummy* as a dependent variable equal to one when a firm repurchases at least 0.25% of its market value of equity and zero otherwise. Previous studies choose the cut-off point in the range of 0.25% to 1% to screen for significant or real repurchase activity. Our findings do not change if we vary the cutoffs from 0 to 1%.<sup>5</sup> Table 1 shows an annual distribution of firms in the sample based on their repurchase activity. Out of 35,445 firm-year observations, we classify 16,719 (or 47%) as repurchasers and 18,729 (or 53%) as non-repurchasers. The lowest level of repurchase activity occurred during the early 1990's, while the strongest repurchase activity occurred during the stock market bubble period in the late 1990's as well as from 2006-2008.

**TABLE 1**  
**DISTRIBUTION OF THE NUMBER OF FIRM-YEAR REPURCHASES**

Year	N	Repurchasers	%	Non-Repurchasers	%
1988	1,532	689	56	843	44
1989	1,473	560	38	913	62
1990	1,453	632	43	821	57
1991	1,366	446	32	920	68
1992	1,307	410	31	897	69
1993	1,386	605	44	781	56
1994	1,436	499	35	937	65
1995	1,557	593	38	964	62
1996	1,550	687	44	863	56
1997	1,652	803	49	849	51
1998	1,939	1,110	62	719	38
1999	1,898	1,179	62	719	38
2000	1,692	992	59	700	41
2001	1,655	752	45	903	55
2002	1,490	669	45	821	55
2003	1,381	666	48	751	52
2004	1,302	610	47	692	53
2005	1,354	723	47	631	47
2006	1,374	789	57	585	43
2007	1,391	822	59	569	41
2008	1,508	875	58	633	42
2009	1,219	488	40	731	60
2010	1,208	573	47	635	53
2011	1,322	730	55	592	45
	35,445	16,719	47	18,729	53

Following the IPO literature, we exclude unit offers, REITs, closed-end funds, banks and S&Ls, ADRs, IPOs not listed on CRSP within six months of issuing, and IPOs from utility and financial industries. We then merge our Compustat's repurchase data with SDC's IPO data based on fiscal year and three-digit SIC code industry in order to have data for IPO related variables.

For our main variable, we use different approaches to capture the market's perception of the competitive threats on the incumbent firms as a result of a large number of IPOs in the same industry in a short period of time. First, for each fiscal year, we count the number of IPOs (Total\_IPOs) which occur in the previous six months in the same three-digit SIC code industry with the incumbent firm. We argue that the more IPOs entering the industry will lead to a stronger perception of the competitive threats to the existing firms. In addition, as Ritter (1991), and Baker and Wurgler (2006, 2007) point out, firms decide to go public when market sentiment is high and, thus, IPO volume is positively related to the degree of market sentiment. To capture the competitive threat of an IPO wave, we create a High\_IPOs dummy variable which receives a value of one when Total\_IPOs is in the top 20th percentile and zero otherwise. Second, given that some industries may have more firms than other industries, the effect of one IPO on a

small industry may be much stronger than on a much larger industry. Thus, we create a relative measure of total IPOs, Adjusted IPOs, which is defined as Total\_IPOs divided by the number of existing firms in the industry. Similarly, we create a dummy variable, High\_AdIPOs which equals one when the IPOs\_Pct is in the top 20th percentile of Adjusted\_IPOs distribution and zero otherwise. Third, the competitive impact of IPOs on rival firms might not only be captured by the number of IPO events but also by the total proceeds from the new issues. Akhigbe, Borde and Whyte (2003) and Hsu et al. (2010), among others, argue that the use of proceeds will increase the competitiveness of IPOs, since new issuing firms will use proceeds to reduce its debt burden or to finance expansions in businesses. Using proceeds to measure the impact of IPOs on competitive conditions within the industry also reduces the problem of counting the number of IPOs, which may include very small IPOs - "penny" IPOs. Our Total\_Proceeds variable is measured as the sum of proceeds of all IPOs which occurred in the previous six months and then scaled by the market capitalization of the industry. The dummy variable, High\_Proceeds, equals one if it is in the top 20th percentile of the Total\_Proceeds distribution and zero otherwise. Finally, previous studies show that the number of IPOs and IPO first-day returns are both positively related to market sentiment (e.g., Ritter (1991), Lowry and Schwert (2002), Baker and Wrugler (2006, 2007)), so we use the first-day return of IPOs as an alternative measure for the competitive threat of IPOs on rival firms during hot IPO markets. Following Ritter's website, we compute both the equally weighted first-day returns (RIPO\_E) and the proceeds weighted first-day returns (RIPO\_P) at the industry level. We then create a dummy variable, High\_RIPO\_E (High\_RIPO\_P) which takes a value of one if RIPO (RIPO\_P) is above its mean and takes a value of zero otherwise. We expect that the coefficients of our proxies for the IPO competitive threat to be positive and significant in both tobit and probit models, showing rival firms repurchase more to support their stock prices under pressure caused by a large number of new entrants.

### **Control Variables**

We include several other explanatory variables to control for other hypothesized reasons for repurchases. For example, previous studies have shown that a firm's past performance has a significant impact on the firm's buyback decision. In particular, Comment and Jarrell (1991), Stephens and Weisbach (1998), Peyer and Vermaelen, 1999, and Dudley and Manakyan (2011) find empirical evidence that a firm's repurchases are negatively related to its prior stock price performance. Following Dittmar (2000), we compute the firm's market-adjusted return as the return of the previous year minus the return of the CRSP equally-weighted portfolio. We include this variable in our regressions to control for the effect of the perceived undervaluation in the previous year on its repurchase activity.

We also control for market-to-book and size. Dittmar (2000) argues that firms with greater investment opportunities (high market-to-book) may be reluctant to pay out cash in the form of repurchases even if the stock is undervalued; they are more likely to have other investment options that would be more profitable than investing in the firm's stock. To control for firm size, we use the log of lagged sales. Size is often considered as a proxy for information asymmetry. Vermaelen (1981) shows that small firms face more information asymmetry than large firms, leading to a larger likelihood of undervaluation for small firms. In contrast, Dittmar (2000) finds that large firms are more likely to repurchase if they are undervalued, suggesting that undervaluation is also prevalent for large firms as well.

Previous research also finds a positive relationship between a firm's repurchases and its cash position. In particular, Stephens and Weisbach (1998), among others, find that managers use repurchases to distribute unexpected cash flows. In a similar vein, Guay and Harford (2000) document that managers use repurchases to distribute transient cash flows and use dividends to payout more permanent cash flows. Following Dudley and Manakyan (2011), we include two cash-related variables, Cash holdings and Cashflows, in our regressions in order to control for the effect of cash on firm repurchases. The details of these variables are described in the appendix.

Additionally, firms may use share repurchases as a means to adjust their capital structure (Bagwell and Shoven (1988) and Opler and Titman (1994)), so we include the Debt/Equity ratio, measured as long-term debt divided by equity, in our regressions. Following Massa et al. (2007), we also include other control variables which have been documented as playing a role in firm payout decisions such as

operating income, non-operating income, capital expenditures, price-earnings ratio (P/E), and dividend ratio. All of the control variables are measured at time t-1. Definitions of the variables are in the appendix.

Previous studies find that intra-industry effects are stronger in concentrated industries (Lang and Stulz (1992), Massa, Rehman and Vermaelen (2007), among others). We conjecture that a rival firm in a concentrated industry is more likely to buy back its stock in the presence of strong IPO activity in its industry, as compared to a firm in a less concentrated industry. Following Massa et al. (2007), we use the Herfindahl Index to measure the degree of concentration in each industry. The Herfindahl index is measured as the sum of the squares of market shares of all the firms in a particular industry for a particular year. Market share is defined as the total sales of the firm in a given year divided the total sales of the industry in the year.<sup>6</sup> The value of this index is bounded between zero and one, where the value of zero is for industries with the highest level of competition and the value of one is for industries with the highest level of monopoly power.

To test the effect of IPO waves on the repurchasing activities of rival firms, we first run basic tobit and probit models, without interaction terms between the IPO\_threat variable and either the Concentration or the Past\_return variable.

Tobit:

$$Rp\_Percentage_t = \beta_0 + \beta_1 IPO\_threat_{t-1} + \beta_3 Control\ variables_{t-1} \quad (1)$$

Probit:

$$Rp\_dummy_t = \beta_0 + \beta_1 IPO\_threat_{t-1} + \beta_3 Control\ variables_{t-1} \quad (2)$$

Because the coefficients of the tobit or probit model have no direct interpretation, we report the marginal effect of a one standard deviation change in a regressor while holding all other regressors at their means. This is accomplished by standardizing all continuous regressors to have a zero mean and a standard deviation of one.<sup>7</sup> The marginal effects for the binary regressors are evaluated as the effect of moving from a value of 0 to a value of 1. In the above regressions,  $\beta_1$  will measure the marginal effect of the competitive threat of IPOs on the repurchase activities of rival firms. We expect that  $\beta_1$  will be positive and significant after controlling for other factors, suggesting that IPO's competitive threat increases the probability as well as the volume of repurchases of rival firms.

In the next step, the IPO competitive threat variable is interacted with the Concentration variable and with the Past\_return variable. In the regressions specified below, the sum of  $\beta_1$ ,  $\beta_2$  and  $\beta_3$  represents the effect of the IPO's competitive threat on the rival firm's repurchase decision when both the Past\_return and concentration are one standard deviation from their means, holding other variables at their means.

Tobit:

$$Rp\_Percentage_t = \beta_0 + \beta_1 IPO\_threat_{t-1} + \beta_2 IPO\_threat_{t-1} * Concentration_{t-1} + \beta_3 IPO\_threat_{t-1} * Past\ return_{t-1} + \beta_4 Concentration_{t-1} + \beta_5 Past\ return_{t-1} + \beta_6 Control\ variables_{t-1} \quad (3)$$

Probit:

$$Rp\_dummy_t = \beta_0 + \beta_1 IPO\_threat_{t-1} + \beta_2 IPO\_threat_{t-1} * Concentration_{t-1} + \beta_3 IPO\_threat_{t-1} * Past\ return_{t-1} + \beta_4 Concentration_{t-1} + \beta_5 Past\ return_{t-1} + \beta_6 Control\ variable_{t-1} \quad (4)$$

Since repurchase activities vary by year and by industry, we use year and industry fixed effect in all of the regressions. In addition, a firm might repurchase multiple times, so we also cluster standard errors by firm to account for the within-firm correlation of residuals across years.

## DESCRIPTIVE STATISTICS AND UNIVARIATE TESTS

Table 2 provides descriptive statistics for all variables used in this paper. The unconditional mean of the repurchase ratio is 0.47, consistent with Massa et al. (2007). On average, a firm repurchases about 2.8% of its market value of equity. The average number of IPOs in the previous six months (Total\_IPOs) is around 2, and the maximum is 24 IPOs. The mean value for IPO first day returns is around 17%, which is similar to the first day returns reported on Ritter's IPO database website.

**TABLE 2**  
**DESCRIPTIVE STATISTICS**

Variable	N	Mean	Median	SD	P1	P99
<b>Repurchase variables</b>						
Dollar repurchases Mil.\$)	35,445	99.669	1.176	628.458	0.000	1684.000
Rp_Percentage	35,445	2.754	0.008	5.464	0.000	24.975
Rp_dummy	35,445	0.471	1.000	0.493	0.000	1.000
<b>IPO variables</b>						
Total_IPOs	35,445	1.856	0.000	6.030	0.000	24.000
Adjusted_IPOs	35,445	0.133	0.110	0.261	0.000	0.952
Total_Proceeds	35,445	8.105	1.374	54.211	0.000	65.659
RIPO_E	35,445	17.151	8.820	27.623	-11.428	116.244
RIPO_P	35,445	17.937	9.627	29.850	-11.427	135.477
<b>IPO dummies</b>						
High_IPOs	35,445	0.217	0.000	0.402	0.000	1.000
High_AdIPOs	35,445	0.211	0.000	0.368	0.000	1.000
High_Proceed	35,445	0.195	0.000	0.398	0.000	1.000
High_RIPO_E	35,445	0.210	0.000	0.317	0.000	1.000
High_RIPO_P	35,445	0.196	0.000	0.342	0.000	1.000
<b>Controls</b>						
Past_return	35,445	0.056	-0.033	0.692	-0.866	2.231
Dividend ratio	35,445	0.520	0.087	6.587	0.000	3.796
Size	35,445	5.004	5.705	2.002	1.602	10.559
M/B	35,445	4.403	1.962	19.836	0.374	17.711
Debt/Equity	35,445	0.737	0.238	6.418	0.000	5.549
Operating income	35,445	0.140	0.144	0.131	-0.306	0.433
Non-operating income	35,445	0.011	0.006	0.026	-0.022	0.078
P/E	35,445	22.966	15.761	114.31	-87.000	256.944
Capital expenditures	35,445	0.062	0.045	0.064	0.001	0.315
Cash holdings	35,445	0.152	0.076	0.182	0.000	0.785
Cash flows	35,445	0.126	0.131	0.147	-0.297	0.471
Concentration	35,445	0.252	0.196	0.205	0.044	1.000

In Table 3, we present the results of the univariate test for repurchasers and non-repurchasers. By design, the repurchasers buyback their shares more often than the non-repurchasers do. Specifically, repurchasers, on average, bought back \$203.9 million, or 5.6% of their market value, while non-



repurchasers only bought back \$6.6 million, or 0.19% of their market value. The mean differences for IPO related variables and IPO dummies are positive and significant, showing stronger IPO activity prior to repurchase events. This initial finding is consistent with our conjecture that the competitive threat of IPOs could play a role in the repurchase decision of the rival firms.

The market-adjusted past return of the average repurchaser is 3%, which is less than one third of the past returns of the average non-repurchaser. This evidence supports the undervaluation hypothesis which states that firms are more likely to buyback their shares when they have been experiencing poor stock performance. This point also emphasizes the importance of controlling for the past return in order to observe the net effect of IPO's competitive threat as well as the interaction term between IPOs' threat and the past return.

**TABLE 3**  
**UNIVARIATE TESTS**

	Repurchasers		Non-Repurchasers		(1)-(2)	t-statistic
	N	Mean	N	Mean		
<b>Repurchase variables</b>						
Rp_Percentage	16,719	5.623	18,729	0.193	5.430	4.36
Dollar repurchases (Mil.\$)	16,719	203.900	18,729	6.624	197.300	21.95
<b>IPO related variables</b>						
Total_IPOs	16,719	1.990	18,729	1.736	0.254	7.50
Adjusted_IPOs	16,719	0.143	18,729	0.125	0.017	8.11
Total_Proceeds	16,719	8.250	18,729	7.971	0.279	5.23
RIPO_E	16,719	18.440	18,729	15.930	2.500	4.18
RIPO_P	16,719	19.410	18,729	16.540	2.880	4.59
<b>IPO Dummies</b>						
High_IPOs	16,719	0.245	18,729	0.192	0.053	11.87
High_AdIPOs	16,719	0.229	18,729	0.195	0.034	7.93
High_Proceeds	16,719	0.219	18,729	0.175	0.044	4.78
High_RIPO_E	16,719	0.277	18,729	0.151	0.126	4.69
High_RIPO_P	16,719	0.251	18,729	0.147	0.104	9.13
<b>Controls</b>						
Past_return	16,719	0.030	18,729	0.097	-0.067	-8.97
Dividend ratio	16,719	0.371	18,729	0.694	-0.322	-2.08
Size	16,719	4.215	18,729	5.708	-0.104	4.39
M/B	16,719	3.827	18,729	4.917	-1.090	4.87
Debt/Equity	16,719	0.785	18,729	0.661	0.124	0.89
Operating income	16,719	0.142	18,729	0.136	0.007	4.23
Non-operating income	16,719	0.011	18,729	0.010	0.001	2.97
P/E	16,719	20.672	18,729	26.640	-5.968	-4.65
Capital expenditures	16,719	0.059	18,729	0.066	-0.007	-9.09
Cash holdings	16,719	0.167	18,729	0.127	0.040	18.56
Cash flows	16,719	0.133	18,729	0.115	0.018	10.17
Concentration	16,719	0.242	18,729	0.268	-0.027	-10.94

In addition, the average repurchaser has a lower dividend ratio and is smaller in both size and market-to-book in comparison with the average non-repurchaser. These observations are also consistent with previous studies (Skinner, 2008, Ikenberry et al., 1995; Peyer and Vermaelen, 2009 among others). The two cash-related variables (Cash holdings and Cash flows) tell us that repurchasers hold more cash and have larger cash flow in comparison with non-repurchasers, in line with prior studies.

In Table 4, we present the correlation matrix of our measurements for IPO's competitive threat. These alternative measurements are highly positively correlated, as expected. This consistency in the different measures suggests that they are good proxies for strong IPO activity even though they are created using different aspects of the IPO events such as number of IPOs, total proceeds, or first-day returns.

**TABLE 4**  
**CORRELATION MATRIX OF MEASURES FOR IPO THREAT**

	<b>High_IPOs</b>	<b>High_AdIPOs</b>	<b>High_Proceeds</b>	<b>High_RIPO_E</b>	<b>High_RIPO_P</b>
<b>High_IPOs</b>	1				
<b>High_AdIPOs</b>	0.613 [0.000]	1			
<b>High_Proceeds</b>	0.600 [0.000]	0.790 [0.000]	1		
<b>High_RIPO_E</b>	0.561 [0.000]	0.528 [0.000]	0.500 [0.000]	1	
<b>High_RIPO_P</b>	0.570 [0.000]	0.527 [0.000]	0.494 [0.000]	0.936 [0.000]	1

## DECISION TO REPURCHASE

### Tobit Model

Table 5 reports the marginal effect of tobit models with different measures for IPOs' competitive threats. Model (1)-(5) uses **High\_IPOs**, **High\_AdIPOs**, **High\_Proceeds**, **High\_RIPO\_E** and **High\_RIPO\_P as IPO\_threat**, respectively. The dependent variable is Rp\_Percentage, which is the dollar repurchases at year t divided by the market value of stocks at year t-1, bounded between zero and one. The variable of interest is the dummy variable, IPO\_threat, which is represented by different measures. The coefficient of this dummy variable measures the average increase in the repurchase percentage of a rival firm caused by the IPOs' threat in the industry.

The results provided in Table 5 show that the coefficients of the IPO\_threat are significantly positive and within the range of 0.41 to 0.62. Given the unconditional mean of repurchase percentage of 2.75% (in Table 2), this result implies an increase of about 15% in the repurchase percentage of the rival firm in the presence of competitive threats from IPOs. This effect holds after controlling for other variables which have been documented as determinants of repurchase decisions. The coefficients of past return, size, and B/M are negative and significant at the 1% level for all of our five specifications. The two cash-related variables have positive and significant coefficients, as expected. The other variables have signs which are consistent with previous studies, including Dittmar (2000), Massa et al. (2007), and Dudley and Manakyan (2011).

Prior research has shown that a firm's past stock performance and the degree of concentration of the firm's industry have a significant impact on the firm's buyback decision (Comment and Jarrell (1991), Stephens and Weisbach (1998), Peyer and Vermaelen, 1999, and Dudley and Manakyan (2011) among others). In the next step, we create an interaction variable between our dummy variable for IPOs threat and the Past\_return variable in order to examine whether poorly performing rival firms intensify their repurchase activity in the presence of competitive threats from IPOs in the industry. In addition, we also

interact our IPO\_threat variable with the Concentration variable to examine the role of industry structure and the degree of concentration in determining the intra-industry impact of IPOs' threat on rival firms' repurchase decisions.

**TABLE 5**  
**DECISION TO REPURCHASE: TOBIT REGRESSIONS**

	(1)	(2)	(3)	(4)	(5)
<b>IPO_threat</b>	0.5180*** [0.124]	0.5086*** [0.1305]	0.4162*** [0.1219]	0.5280*** [0.1425]	0.6237*** [0.1413]
Past_return	-0.2840*** [0.0474]	-0.2783*** [0.0474]	-0.2750*** [0.0471]	- 0.2714*** [0.0478]	-0.2717*** [0.0476]
Size	-0.1710*** [0.0263]	-0.1662*** [0.0251]	-0.1007*** [0.0391]	- 0.1042*** [0.0395]	-0.1012*** [0.0344]
M/B	-0.1220*** [0.0510]	-0.1210*** [0.0601]	-0.1253*** [0.0701]	- 0.1282*** [0.0613]	-0.1285*** [0.0635]
Dividend ratio	-0.0953*** [0.0297]	-0.0496* [0.0292]	-0.0495* [0.0299]	-0.498* [0.0299]	-0.0501* [0.0281]
Debt/Equity	-0.0604 [0.1691]	-0.0189 [0.1699]	-0.0013 [0.0014]	-0.0046 [0.0033]	-0.0011 [0.0024]
P/E	-0.0022*** [0.0004]	-0.0041*** [0.0001]	-0.0040*** [0.0001]	- 0.0024*** [0.0004]	-0.0027*** [0.0001]
Non-operating income	0.1170** [0.0523]	0.1177** [0.0520]	0.1223*** [0.0514]	0.1361*** [0.0314]	0.1823*** [0.0316]
Operating income	0.8342*** [0.0839]	0.8351*** [0.0814]	0.7451*** [0.0648]	0.8051*** [0.0621]	0.8817*** [0.0625]
Capital expenditures	-0.7235*** [0.0658]	-0.721*** [0.0615]	-0.7319*** [0.0627]	- 0.7751*** [0.0515]	-0.7212*** [0.0812]
Cash holdings	0.4235*** [0.0411]	0.4782*** [0.0413]	0.5138*** [0.0412]	0.5718*** [0.0432]	0.5163*** [0.0414]
Cash flows	0.7621*** [0.0559]	0.666*** [0.0511]	0.6246*** [0.0514]	0.6452*** [0.0519]	0.6133*** [0.0545]
Intercept	0.8238*** [0.1923]	0.8195*** [0.2179]	0.9522*** [0.3455]	0.9732*** [0.3002]	0.9568*** [0.3090]
Dummies	Yes	Yes	Yes	Yes	Yes
Pseudo-R squared	0.0412	0.0532	0.0487	0.0417	0.0485
N	35,445	35,445	35,445	35,445	35,445

Standard errors are corrected for clustering by firms and in parentheses. \*\*\*, \*\*, \* denote significance at 1%, 5% and 10% level, respectively.

**TABLE 6**  
**DECISION TO REPURCHASE-TOBIT REGRESSIONS WITH**  
**INTERACTION VARIABLES**

	(1)	(2)	(3)	(4)	(5)
<b>IPO_threat</b>	0.4583*** [0.1185]	0.4527*** [0.1328]	0.3814*** [0.1239]	0.4252*** [0.1312]	0.4712*** [0.1397]
<b>IPO_threat*Concentration</b>	0.1324** [0.0612]	0.1474* [0.0755]	0.1352* [0.0801]	0.1359* [0.0813]	0.1334* [0.0816]
<b>IPO_threat*Past_return</b>	-0.2131*** [0.0714]	-0.2415*** [0.0798]	-0.2316*** [0.0802]	-0.2273** [0.1143]	-0.2315** [0.1141]
Concentration	-0.2515*** [0.0495]	-0.3741*** [0.0495]	-0.3232*** [0.0496]	- 0.3225*** [0.0476]	-0.3561*** [0.0495]
Past_return	-0.2254*** [0.0531]	-0.2183*** [0.0474]	-0.2150*** [0.0471]	- 0.2314*** [0.0478]	-0.2317*** [0.0476]
Size	-0.1651*** [0.0263]	-0.1612*** [0.0271]	-0.1009*** [0.0381]	- 0.1042*** [0.0313]	-0.1022*** [0.0347]
M/B	-0.1220*** [0.051]	-0.1210*** [0.061]	-0.1253*** [0.070]	- 0.1272*** [0.061]	-0.1286*** [0.061]
Dividend ratio	-0.0957*** [0.0297]	-0.0486* [0.0291]	-0.0148 [0.0297]	-0.0478 [0.0295]	-0.0510* [0.0283]
Debt/Equity	-0.0611 [0.1690]	-0.0180 [0.1690]	-0.0011 [0.0013]	-0.0046 [0.0034]	-0.0013 [0.0023]
P/E	-0.0021*** [0.0004]	-0.0042*** [0.0001]	-0.0043*** [0.0001]	- 0.0024*** [0.0000]	-0.0027*** [0.0000]
Non-operating income	0.1171** [0.0533]	0.1175** [0.0540]	0.1214*** [0.0514]	0.1360*** [0.0313]	0.1822*** [0.0315]
Operating income	0.8345*** [0.0840]	0.8352*** [0.0824]	0.7452*** [0.0648]	0.8052*** [0.0631]	0.8819*** [0.0627]
Capital expenditures	-0.7237*** [0.0658]	-0.719*** [0.0616]	-0.7320*** [0.0625]	- 0.7755*** [0.0614]	-0.7222*** [0.0611]
Cash holdings	0.4237*** [0.0410]	0.4785*** [0.0411]	0.5141*** [0.0410]	0.5721*** [0.0430]	0.5166*** [0.0412]
Cash flows	0.7622*** [0.0560]	0.667*** [0.0511]	0.6231*** [0.0512]	0.6451*** [0.0520]	0.6131*** [0.0542]
Intercept	0.8258*** [0.1923]	0.8175*** [0.2179]	0.9523*** [0.3455]	0.9712*** [0.3005]	0.9588*** [0.3091]
Dummies	Yes	Yes	Yes	Yes	Yes
Pseudo-R squared	0.0417	0.0522	0.0466	0.0447	0.0495
N	35,445	35,445	35,445	35,445	35,445

Standard errors are corrected for clustering by firms and in parentheses. \*\*\*, \*\*, \* denote significance at 1%, 5% and 10% level, respectively.

Table 6 reports the marginal effects of our tobit models with the two interaction variables. The results show that the coefficients of the interaction term between the IPO threat dummy and the Concentration variable,  $IPO\_threat * Concentration$ , are positive and significant for all specifications. These findings indicate that a rival firm in a concentrated industry repurchases more than a firm in a less concentrated industry in the presence of a competitive threat from IPOs.

Moreover, for all of our specifications, the coefficients of the interaction term between  $IPO\_threat$  and the  $Past\_return$  variable are negative and strongly significant at the 1% level. The negative sign of this interaction term suggests that a rival firm will buy back its shares even more in the presence of competitive threat from IPOs if the rival has had poor stock performance in the prior year. The sum of  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$  is equal to the marginal effect of IPOs' competitive threat on the repurchase percentage of a rival firm with a previous year return that is one standard deviation below its mean, and an industry concentration that is one standard deviation above its mean. Specifically, Table 6 shows that the rival firm whose past return is one standard deviation below its mean and whose industry concentration is one standard deviation above its mean increases its repurchase percentage by 0.80 in the presence of competitive threats from IPOs.<sup>8</sup> Given the unconditional mean of repurchase percentage is 2.75%, this is equivalent to a 29.20% increase in the repurchase percentage of the rival firm. The coefficients on other control variables are similar in both magnitude and sign to those in Table 5.

### **Probit Model**

In this section we use the probit model to estimate the probability that the rival firm repurchases its stock in the presence of IPOs' competitive threats. The dependent variable is a binary variable,  $Rp\_dummy$ , which equals one when a firm repurchases at least 0.25% of its market value of equity. Similar to the tobit models, we also run the probit models using different measures of the competitive threats of IPOs.

Table 7 reports the marginal effects of the probit models. The coefficients of  $IPO\_threat$  are significantly positive for all specifications and in the range from 0.052 to 0.078. Given the unconditional probability of repurchasing is 0.47, this suggests that the probability that the rival firm will buy back its stocks in the presence of competitive threats from IPOs increases by at least 11.06%.<sup>9</sup> The coefficients for  $Size$ ,  $M/B$ , and  $Past\_return$  are negative and significant, as expected, in line with prior studies.

**TABLE 7**  
**DECISION TO REPURCHASE-PROBIT REGRESSIONS**

	(1)	(2)	(3)	(4)	(5)
<b>IPO_threat</b>	0.0776*** [0.0214]	0.0781*** [0.0211]	0.0524** [0.0216]	0.0593*** [0.0225]	0.0546*** [0.0205]
Past_return	-0.0489*** [0.0085]	-0.0488*** [0.0084]	-0.0486*** [0.0084]	-0.0482*** [0.0085]	-0.0488*** [0.0085]
Size	-0.0547*** [0.0091]	-0.0541*** [0.0090]	-0.0546*** [0.0094]	-0.0546*** [0.0094]	-0.0543*** [0.0094]
M/B	-0.0356* [0.0195]	0.0359* [0.0196]	0.0359* [0.0195]	0.0357* [0.0195]	0.0357* [0.0195]
Dividend ratio	-0.0230*** [0.0005]	-0.0231*** [0.0005]	-0.0230*** [0.0005]	-0.0230*** [0.0005]	-0.0230*** [0.0004]
Debt/Equity	0.0493 [0.0330]	0.0493 [0.0330]	0.0492 [0.0331]	0.0492 [0.0332]	0.0492 [0.0331]
P/E	-0.0779*** [0.0001]	-0.0778*** [0.0001]	-0.0775*** [0.0001]	-0.0776*** [0.0001]	-0.0776*** [0.0001]
Non-operating income	0.0331*** [0.0098]	0.0329*** [0.0098]	0.0323*** [0.0095]	0.0333*** [0.0097]	0.0333*** [0.0096]
Operating income	0.0343*** [0.0018]	0.0343*** [0.0018]	0.0342*** [0.0015]	0.0344*** [0.0017]	0.0344*** [0.0017]
Capital expenditures	-0.0923*** [0.0034]	-0.0923*** [0.0033]	-0.0923*** [0.0033]	-0.0927*** [0.0034]	-0.0927*** [0.0034]
Cash holdings	0.0649*** [0.0073]	0.0649*** [0.0071]	0.0649*** [0.0071]	0.0649*** [0.0073]	0.0649*** [0.0073]
Cash flows	0.0927*** [0.0094]	0.0927*** [0.0094]	0.0927*** [0.0091]	0.0927*** [0.0092]	0.0927*** [0.0092]
Intercept	0.4443 [0.2821]	0.4443 [0.2823]	0.4444 [0.2822]	0.4443 [0.2821]	0.4444 [0.2822]
Dummies	Yes	Yes	Yes	Yes	Yes
Pseudo-R squared	0.044	0.0557	0.0457	0.0457	0.0485
N	35,445	35,445	35,445	35,445	35,445

**TABLE 8**  
**DECISION TO REPURCHASE: PROBIT REGRESSIONS WITH**  
**INTERACTION VARIABLES**

	(1)	(2)	(3)	(4)	(5)
<b>IPO_threat</b>	0.0525*** [0.0173]	0.0511*** [0.0181]	0.0412** [0.0210]	0.0453** [0.0205]	0.0466** [0.0205]
<b>IPO_threat*Concentration</b>	0.0480*** [0.0203]	0.0378*** [0.0119]	0.0199* [0.0105]	0.0284* [0.0158]	0.0274* [0.0158]
<b>IPO_threat*Past_return</b>	-0.0753*** [0.0242]	-0.0352** [0.0187]	- 0.0621*** [0.0178]	-0.0438*** [0.0094]	-0.0687*** [0.0178]
Concentration	-0.0419*** [0.0094]	-0.0419*** [0.0094]	- 0.0421*** [0.0095]	-0.0419*** [0.0093]	-0.0419*** [0.0093]
Past return	-0.0485*** [0.0085]	-0.0485*** [0.0085]	- 0.0487*** [0.0086]	-0.0483*** [0.0085]	-0.0483*** [0.0085]
Size	-0.0547*** [0.0091]	-0.0542*** [0.0091]	- 0.0547*** [0.0093]	-0.0546*** [0.0094]	-0.0544*** [0.0093]
M/B	-0.0357* [0.0195]	0.0355* [0.0196]	0.0358* [0.0194]	0.0357* [0.0193]	0.0356* [0.0193]
Dividend ratio	-0.0233*** [0.0004]	-0.0230*** [0.0004]	- 0.0232*** [0.0005]	-0.0235*** [0.0005]	-0.0235*** [0.0004]
Debt/Equity	0.0491 [0.0331]	0.0491 [0.0331]	0.0492 [0.0331]	0.0492 [0.0331]	0.0492 [0.0331]
P/E	-0.0780*** [0.0001]	-0.0776*** [0.0001]	- 0.0775*** [0.0001]	-0.0776*** [0.0001]	-0.0776*** [0.0001]
Non-operating income	0.0332*** [0.0097]	0.0331*** [0.0097]	0.0324*** [0.0096]	0.0333*** [0.0097]	0.0334*** [0.0097]
Operating income	0.0345*** [0.0017]	0.0345*** [0.0019]	0.0342*** [0.0014]	0.0344*** [0.0017]	0.0343*** [0.0017]
Capital expenditures	-0.0921*** [0.0033]	-0.0923*** [0.0033]	- 0.0921*** [0.0033]	-0.0929*** [0.0034]	-0.0928*** [0.0034]
Cash holdings	0.0647*** [0.0072]	0.0646*** [0.0072]	0.0645*** [0.0071]	0.0649*** [0.0072]	0.0649*** [0.0072]
Cash flows	0.0926*** [0.0093]	0.0926*** [0.0093]	0.0927*** [0.0091]	0.0927*** [0.0093]	0.0927*** [0.0092]
Intercept	0.4447 [0.2822]	0.4447 [0.2823]	0.4444 [0.2822]	0.4444 [0.2822]	0.4444 [0.2822]
Dummies	Yes	Yes	Yes	Yes	Yes
Pseudo-R squared	0.044	0.0557	0.0467	0.0487	0.0485
N	35,445	35,445	35,445	35,445	35,445

Table 8 reports the marginal effects of probit models with the two interaction variables. These results are consistent with those of the tobit models in the previous section. Specifically, the coefficients of the interaction term between the *IPO\_threat* dummy and the *Concentration* variable, *IPO\_threat\*Concentration*, are positive and significant for all specifications. This finding suggests that, when faced with competitive threats from IPOs, a rival firm in a concentrated industry is more likely to repurchase its shares than a firm in a less concentrated industry. In addition, the interaction term between *IPO\_threat* and the *Past\_return*, *IPO\_threat\*Past\_return* is negative and significant at the 1% level of confidence, suggesting that the probability of repurchasing stock in response to the competitive threats caused by IPOs is even higher if the rival firm has been experiencing poor stock performance in the previous year. In particular, the results from Table 8 shows that rival firms whose previous year return is one standard deviation below its mean and the level of industry concentration is one standard deviation above its mean increase its probability of repurchasing shares by around 0.17 in the presence of competitive threats from IPOs in the industry. With an unconditional probability of repurchase of 0.47, this result indicates that the probability that a poorly performing rival firm in a concentrated industry will buyback its stock increases by about 37.1%. This reflects a 26% increase in the probability of repurchase compared to the case where the rival firm has an average stock performance and is in an industry with an average level of concentration. The coefficients for other control variables are similar to the findings in Table 7.

In examining corporate financing waves, Dittmar and Dittmar (2008) look at the aggregate patterns of equity issuances, repurchases, and mergers and find interesting linkages among these events. In particular, they find that repurchases are positively correlated with both equity issuances and mergers at the aggregate level. The correlation between repurchase and equity issuance activity is 90%. This result seems inconsistent with the market-timing explanation which predicts a negative correlation between equity issuance waves and repurchases waves. They observe that both equity issuance waves and repurchase waves are reactions to a common stimulus, GDP growth. Specifically, both repurchases and issues tend to increase over an economic expansion and decrease over an economic contraction. Growth in issues tends to occur in earlier stages of the cycle than growth in repurchases because, in the early stage of the cycle, firms are in greater need of funds to finance their relatively strong investment opportunities. In the later stages, firms experience excess cash and will distribute it through stock repurchases. Even though we control for the effects of the firm's cash flow position in the regressions, we want to examine whether the impacts of IPO waves on the rival firms' repurchasing behavior are influenced by business cycles as pointed out by Dittmar and Dittmar (2008). To address this issue, we stratify our sample period into expansion and contraction periods using the National Bureau of Economic Research (NBER)'s definition and re-run our regressions.<sup>10</sup> In addition, since the sample period includes the internet bubble years of 1999 and 2000, during which many IPOs took place, we need to control for this time period. In addition, Grullon and Michaely (2002) also point out that during the same time period, 1999 and 2000, share repurchases, for the first time in history, became more common than dividends. While we control for year effect in our regressions, we re-run our regressions using a sample without observations in 1999 and 2000.

Table 9 reports the marginal effects of the tobit models for the three subsamples. We only report the results for *High\_IPOs* dummy to save space since our other measures for *IPO\_threat* provide similar results. The results from Table 9 show that, on average, the effects of IPOs' competitive threats on rival firms' repurchases are somewhat stronger in the expansionary period; however, these effects are still statistically and economically significant in the contractionary period as well. In particular, given the IPOs' competitive threat within the last six months, the rival firm will increase its repurchases by about 0.48 (or 18.6%) in recessionary economy and by about 0.52 (or 18.9%) in an expansionary economy. Moreover, if the rival firm's previous year return is one standard deviation below its mean and its industry concentration is one standard above its mean, the repurchase volume will increase by about 0.66 (or 24.0%) in a recessionary economy and by about 0.77 (or 28.0%) in an expansionary economy. For the subsample without the two bubble years, 1999 and 2000, we reach similar conclusions as those with the full sample.



**TABLE 9**  
**THE REPURCHASE DECISION: CONTROLLING FOR ECONOMIC CONDITIONS**

	<b>Recession</b>		<b>Expansion</b>		<b>Without Bubble</b>	
<b>High_IPOs</b>	0.4814**	0.4412**	0.5214***	0.4621***	0.5113***	0.4611***
	[0.2283]	[0.2250]	[0.1104]	[0.1105]	[0.1224]	[0.1126]
<b>High_IPOs*Conct.</b>		0.0960***		0.1113*		0.1301**
		[0.0371]		[0.0611]		[0.0613]
<b>High_IPOs*Past_ret.</b>		-0.1315*		-0.2012***		-0.2441***
		[0.0713]		[0.0728]		[0.0745]
Concentration		-0.2113***		-0.2523***		-0.2601***
		[0.0456]		[0.0485]		[0.0414]
Past_return	-0.2601***	-0.2311***	-0.2932***	-0.2110***	-0.2834***	-0.2251***
	[0.0421]	[0.0422]	[0.0593]	[0.0524]	[0.0469]	[0.0532]
Size	-0.1510***	-0.1530***	-0.1810***	-0.1810***	-0.1771***	-0.1713***
	[0.0265]	[0.0263]	[0.0203]	[0.0202]	[0.0267]	[0.0264]
M/B	-0.1310***	-0.1310***	-0.1171***	-0.1175***	-0.1221***	-0.1220***
	[0.048]	[0.047]	[0.053]	[0.049]	[0.049]	[0.051]
Dividend ratio	-0.0976***	-0.0978***	-0.1230***	-0.1170***	-0.0961***	-0.0956***
	[0.0295]	[0.0295]	[0.0297]	[0.0296]	[0.0295]	[0.0299]
Debt/Equity	-0.0502	-0.0505	-0.0852	-0.0853	-0.0612	-0.0611
	[0.1823]	[0.1816]	[0.1722]	[0.1721]	[0.1690]	[0.1692]
P/E	-0.0045***	-0.0045***	-0.0018***	-0.0018***	-0.0021***	-0.0021***
	[0.0016]	[0.0014]	[0.0010]	[0.0010]	[0.0004]	[0.0004]
Non-operating income	0.1032**	0.1033**	0.1214**	0.1214**	0.1171**	0.1170**
	[0.0523]	[0.0524]	[0.0523]	[0.0525]	[0.0524]	[0.0532]
Operating income	0.5188***	0.5191***	0.8712***	0.8712***	0.8339***	0.8346***
	[ 0.0845]	[ 0.0823]	[ 0.0861]	[ 0.0857]	[ 0.0837]	[ 0.0841]
Capital expenditures	-0.6651***	-0.6650***	-0.8110***	-0.8111***	-0.7235***	-0.7240***
	[0.0847]	[0.0845]	[0.0758]	[0.0758]	[0.0655]	[0.0657]
Cash holdings	0.3772***	0.3768***	0.4621***	0.4622***	0.4232***	0.4233***
	[0.0445]	[0.0440]	[0.0403]	[0.0402]	[0.0413]	[0.0411]
Cash flows	0.7621***	0.7611***	0.7621***	0.7620***	0.7623***	0.7622***
	[0.0759]	[0.0745]	[0.0563]	[0.0562]	[0.0557]	[0.0561]
Intercept	1.1142***	1.1108***	0.7255***	0.7257***	0.8237***	0.8236***
	[0.2366]	[0.2322]	[0.1542]	[0.1544]	[0.1920]	[0.1922]
Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R squared	0.0412	0.0412	0.0488	0.0488	0.0488	0.0488
N	6,627	6,627	28,818	28,818	29,449	29,449

**TABLE 10**  
**PROBABILITY OF REPURCHASE: CONTROLLING FOR ECONOMIC CONDITIONS**

	<b>Economic recession</b>		<b>Economic expansion</b>		<b>Without Bubble Years</b>	
<b>High_IPOs</b>	0.0522**	0.0311*	0.0781***	0.0652***	0.0713***	0.0518***
	[0.0244]	[0.0184]	[0.0212]	[0.0166]	[0.0215]	[0.0163]
<b>High_IPOs*Conct.</b>		0.0412**		0.0487***		0.0465***
		[0.0208]		[0.0201]		[0.0207]
<b>High_IPOs*Past_ret.</b>		-0.0551**		-0.0771***		-0.0615***
		[0.0246]		[0.0236]		[0.0232]
Concentration		-0.0338***		-0.0474***		-0.0433***
		[0.0065]		[0.0099]		[0.0091]
Past_return	-0.0461***	-0.0421***	-0.0501***	-0.0491***	-0.0490***	-0.0455***
	[0.0085]	[0.0094]	[0.0085]	[0.0082]	[0.0085]	[0.0071]
Size	-0.0512***	-0.0501***	-0.0581***	-0.0561***	-0.0547***	-0.0547***
	[0.0075]	[0.0112]	[0.0098]	[0.0091]	[0.0093]	[0.0091]
M/B	-0.0311*	-0.0322	-0.0372*	-0.0388*	-0.0355*	-0.0351*
	[0.0163]	[0.0205]	[0.0199]	[0.0197]	[0.0193]	[0.0194]
Dividend ratio	-0.0221***	-0.0218***	-0.0214***	-0.0210***	-0.0209***	-0.0201***
	[0.0009]	[0.0004]	[0.0005]	[0.0005]	[0.0005]	[0.0005]
Debt/Equity	0.0322	0.0472	0.0475	0.0496	0.0471	0.0492
	[0.0345]	[0.0521]	[0.0341]	[0.0329]	[0.0331]	[0.0331]
P/E	-0.0611***	-0.0613***	-0.0791***	-0.0791***	-0.0783***	-0.0781***
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
Non-operating income	0.0300***	0.0222**	0.0366***	0.0475***	0.0329***	0.0365***
	[0.0081]	[0.0105]	[0.0097]	[0.0089]	[0.0098]	[0.0096]
Operating income	0.0317***	0.0315***	0.0364***	0.0373***	0.0341***	0.0342***
	[0.0009]	[0.0011]	[0.0021]	[0.0019]	[0.0020]	[0.0019]
Capital expenditures	-0.0715***	-0.0772***	-0.0977***	-0.0974***	-0.0926***	-0.0923***
	[0.0052]	[0.0054]	[0.0022]	[0.0029]	[0.0035]	[0.0035]
Cash holdings	0.0511***	0.0551***	0.0687***	0.0727***	0.0655***	0.0627***
	[0.0052]	[0.0072]	[0.0070]	[0.0071]	[0.0072]	[0.0072]
Cash flows	0.0718***	0.0658***	0.0966***	0.0994***	0.0941***	0.0974***
	[0.0065]	[0.0066]	[0.0095]	[0.0091]	[0.0092]	[0.0091]
Intercept	0.4102	0.421	0.4451	0.4625	0.4452	0.4427
	[0.2011]	[0.2712]	[0.2917]	[0.2852]	[0.2817]	[0.2819]
Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R squared	0.0412	0.0412	0.0488	0.0488	0.0488	0.0488
N	6,627	6,627	28,818	28,818	29,449	29,449

Table 10 reports the marginal effects of the probit models for the same three subsamples. Again, only the results for High\_IPOs dummy are reported to save space. Similar to the tobit results, the findings from Table 10 show that the effects of IPOs' competitive threats on rival firms' probability of repurchases are stronger in the expansionary period, but still significant in the contractionary periods as well. More specifically, in response to the IPOs competitive threats, the rival firm will increase its probability of repurchase by about 0.05 (or 10.6%) if the economy is in recession, and by about 0.07 (or 14.9%) if the economy is in expansion. These effects are even more pronounced for firms with poor return performance in the prior year (25.5% increase in repurchase probability) and for firms in high concentration industries

(36% increase in repurchase probability), consistent with our previous findings. Focusing on the subsample without the bubble years, the results of the probit model are very close to the results for the entire sample, indicating that our previous conclusions are not driven by the bubble years.

Overall, these results provide robust evidence that firms may strategically use repurchases in response to the competitive threats associated with IPO waves in their industry. In documenting this competitive-based motivation for repurchases, these findings further highlight the complexity of the repurchase decision.

## CONCLUSION

The goal of this paper is to examine whether rival firms use repurchases as a strategic reaction to the competitive effects of IPOs in the same industry. We find that rival firms increase their repurchases in response to the competitive threats caused by a large number of IPOs in the industry during the previous six months. The intensity of repurchase activities depends on the rival firm's previous year stock performance and the level of concentration in its industry. In particular, the rival firm's repurchase is negatively related to its previous year return and positively related to the level of concentration in its industry. In identifying this new link between IPO activity and intra-industry rival firm repurchase activity, these findings highlight a previously unrecognized motivation behind the repurchase decision. Also, this paper adds intriguing new evidence on intra-industry signaling by showing that certain events such as IPOs can affect not only rival firm stock prices, but also rival firm decisions. Furthermore, our paper provides insight on the sequence of equity issuance and repurchase waves documented in Dittmar and Dittmar (2008), by showing that IPO waves can provoke repurchases within the same industry.

## ENDNOTES

1. In examining all IPOs, both large and small, Akhigbe et al. (2003) do not find a general valuation effect for industry rivals in response to IPOs.
2. For example, see Ritter, 1991, Loughran and Ritter, 1995, Jain and Kini, 1994, Mikkelson and Shah, 1994, and Purnanandam and Swaminathan (2004), among others.
3. Other well-known reasons for stock repurchases include the following: dividend substitution, capital structure adjustment, tax savings, takeover defense, option funding, and earnings bump. These reasons do not have direct relevance to our study so we do not review this literature to conserve space.
4. Compustat starts recording repurchase data since 1986. We require that firms have return data in the past twelve months so we lose repurchases in 1986. Following previous studies, we exclude 1987 due to the financial crash.
5. Dittmar (2000) and Bonaime and Rynngaert (2013) use the cut-off point ranging from 0.25% to 1% of a firm's market value of equity. Stephens and Weisbach (1998) show that the mean and median target repurchase are 7% and 5%, respectively.
6. The industry is defined at the three-digit SIC code from CRSP
7. Marginal effects are computed following Ai and Norton (2003) and Norton and Wang, and Ai (2004)
8. Computed by using data on the High\_IPOs column as an illustration,  $0.4583+0.1324*1+(-0.2131)*(-1)=0.8038$
9.  $0.052/0.47=0.1106$  or 11.06%
10. National Bureau of Economic Research (NBER) defined recessionary economies as in July 1981 –Nov 1982, July 1990 –Mar 1991, March 2001–Nov 2001, and Dec 2007 – June 2009. Because our repurchase data is per year, we consider the entire year as recession year, i.e., 1981, 1982, 1990, 1991, 2001, 2007, 2008 and 2009 are considered recession years.

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## APPENDIX

### **Repurchase Variables:**

**Dollar repurchases (mil.\$):** The repurchase of common and preferred stocks (prstkc) less any decrease in preferred stock. Preferred stocks are measured as, in order of preference, redemption value (pstkr), liquidating value (pstkl), or carrying value (pstk).

**Percent repurchases:** Dollar repurchases at year t divided by market value of stocks at year t-1.

**Repurchase dummy:** Dummy variable takes on value of 1 when a firm repurchases at least 1% of its value (percent repurchases  $\geq 1$ ) and zero otherwise

**Total payout (mil.\$):** Sum of repurchases and dividends

**Repurchases/Total payout:** Dollar repurchases divided by Total payout

### **IPO Related Variables:**

**Total\_IPOs:** The total numbers of IPOs that occur in the same three-digit SIC code industry in the previous six months of the current year.

**IPOs\_Pct:** Total IPOs divided by total number of firms in the same three-digit SIC code industry

**Total\_Proceed\_Pct:** Total IPO proceeds divided by the total of market value of stocks in the same three-digit SIC code industry. Total IPO proceeds is sum of proceeds of IPOs that occur in the same three-digit SIC code industry in the previous six months of the current year.

**RIPO\_E:** Equally weighted first-day returns

**RIPO\_P:** Proceeds weighted first-day returns

**High\_IPOs:** Dummy variable takes on value of 1 when Total\_IPOs is on its top 20th percentile and zero otherwise.

**High\_IPOs\_Pct.:** Dummy variable takes on value of 1 when IPOs\_Pct is on its top 20th percentile and zero otherwise.

**High\_Proceed\_Pct.:** Dummy variable takes on value of 1 when Total\_Proceed\_Pct is on its top 20th percentile and zero otherwise.

**High\_RIPO\_E:** Dummy variable takes on value of 1 when RIPO\_E is greater than mean value, and zero otherwise.

**High\_RIPO\_P:** Dummy variable takes on value of 1 when RIPO\_P is greater than mean value, and zero otherwise.

**Control Variables:**

**Past return:** The compounded monthly return for the previous year

**Dividend ratio:** Total dividends divided by the net income available to common stockholders

**Size:** The logarithm of the total assets of the firms

**M/B:** Market value of stock divided by its book value

**Market value (mil.\$):** Market value of stock at the end of the fiscal year

**Debt/Equity:** Long-term debt divided by total equity

**Operating income:** Operating income divided by total assets

**Non-operating income:** Non-operating income divided by total assets

**P/E:** Stock price divided by earnings per share at the end of fiscal year

**Capital expenditures:** Capital expenditure divided by the total assets

**Cash holdings:** Cash and equivalents (cheq) divided by total assets

**Cashflows:** Cashflow is computed as sales (saleq) minus cost of goods sold (cogsq) minus selling, general, and administrative expenses (xsgaq) minus the change in working capital. Working capital is defined as accounts receivable (rectq) plus inventory (invtq) plus other current assets (acoq) minus the sum of accounts payable, income taxes payable (txpq), and other current liabilities (lcoq). Selling, general, and administrative expenses are decreased by one-quarter of the annual value of research and development (xrd) and advertising expenses (xad), when available.

**Concentration:** Based on Herfindahl index which is measured as sum of the squared market share of each firm in the same industry during a year. Market share is defined as the total sales of the firm in a given year divided by the total sales of the industry in the year. The industry is defined at the three digit SIC code (SICCD) level. Sales are measured as moving average over the past three years.